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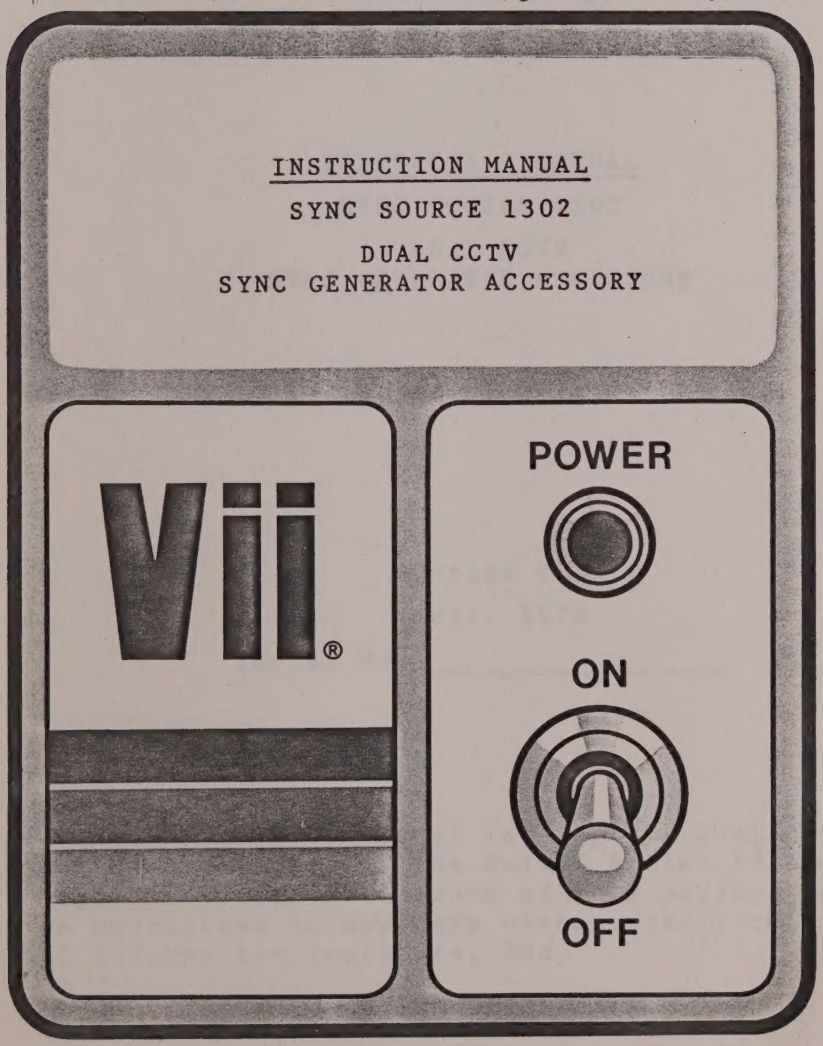
INSTRUCTION MANUAL

SYNC SOURCE 1302

DUAL CCTV
SYNC GENERATOR ACCESSORY



GENERAL ELECTRIC
INSTRUMENTATION & COMMUNICATION
1200 KONA DRIVE
COMPTON, CA 90220
(213) 642-5317

M16790X
Electronic Services - Los Angeles

GENERAL ELECTRIC
1200 KONA DRIVE
COMPTON, CA 90220
(213) 604-8312

INSTRUCTION MANUAL

SYNC SOURCE 1302

DUAL CCTV
SYNC GENERATOR ACCESSORY

Series F

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Serial No. _____

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VISUAL INFORMATION INSTITUTE, INC.

Box 33 / Xenia, Ohio 45385 / Phone (513) 376-4361

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Visual Information Institute, Inc. has Technical Notes and Charts available for your information relating to specific technical applications of our test equipment. These include:

* High-Technology Television

* The Reality of TV Resolution Specifications

* Raster Scan/Television Video and Synchronizing Signals - Recommended Standard Practice

* Television Scan Linearity Analysis

* Standardization of the Television Raster

* Clocked Raster - A Question and Answer Session

* Bar and Dot Application

* Precision Television Raster

For further information, please contact:

Visual Information Institute, Inc.
ATTN: J. Susan Anderson
P. O. Box 33
Xenia, OH 45385-0033
(513) 376-4361

This manual is prepared on the premise that the user is familiar with television system terms and concepts, and particularly is acquainted with the use of electronic test instruments (such as an oscilloscope) to interpret television waveforms and to relate the content of such waveforms to the pattern which would be produced on a typical television display device. If this is not the case, background reference material is suggested as follows:

a. Glasford, Glenn M., Fundamentals of Television Engineering (New York, NY: McGraw-Hill Book Co., Inc., 1955).

b. Showalter, Leonard C., Clocked-Circuit TV for Engineers and Technicians (Indianapolis, Indiana: Howard W. Sams & Co., 1969).

c. Hansen, Gerald L., Introduction to Solid-State Television Systems (Englewood Cliffs, NJ:Prentice-Hall, Inc., 1969).

d. Fink, Donald G. (Ed.), Television Engineering Handbook (New York, NY: McGraw-Hill Book Co., Inc., 1957).

Please contact Visual Information Institute if additional information is desired on television tests and measurements or about application of this instrument.

You must read the instruction manual completely before connecting the Signal Source Generator for operation. Observance of only a few procedures will provide greater operator convenience, and will assure most effective application of the equipment as well as provide maximum safety to the user.

CAUTION

Even low voltages commonly present in transistorized circuits are potentially dangerous. Additionally, full line voltage is present on fuse terminals, power switch terminals, and other exposed points within the interior of the unit, and are accessible when the cover of the equipment is removed. Caution should be exercised, as follows:

a. Remove power by unplugging the line cord when removing covers and inspecting interior of the unit.

b. Observe the common safety practices when servicing equipment (dry skin, insulation of the body from ground, etc.).

c. Never work on electrical equipment when alone. Service and calibration should be attempted only by a qualified electronics technician.

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INTRODUCTION

This instruction manual contains all essential information for the proper connection and use of the Signal Source CCTV Generators; the manual contains maintenance information as well.

This device contains circuits which are considered proprietary. Duplication of Signal Source equipment is not authorized without the expressed, written consent of Visual Information Institute, Inc. These instruments, as described in this manual, are manufactured under U. S. Patent No. 3,483,479, plus other domestic and foreign patents pending.

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a. Remove power by unplugging the line cord when removing covers and inspecting interior of the unit.

b. Observe the common safety practices when servicing equipment (dry skin, insulation of the body from ground, etc.).

c. Never work on electrical equipment when alone.

APPLICATIONS

Sync Source generators develop precise synchronizing pulses for exact and effective synchronization of closed circuit television devices, including test pattern generators, cameras, display devices, etc. This particular generator, Sync Source 1302, provides synchronizing waveforms as specified by

Electronic Industries Association Standards RS-170, RS-330 and RS-343. In addition to H Drive, V Drive and Mixed Blanking, this unit generates a Composite Sync signal which includes front porch delays in the vertical and horizontal sync plus optional serrations and equalizing pulses in the vertical interval which are selectable by circuit card jumpers.

This instrument is useable at any one scanning rate, including 525, 675, 729, 875, 945, 1023, 1029 and 1225 at a 60 Hz field rate, or 625 at a 50 Hz field rate; other "non-standard" line numbers may be employed by special interconnection and use of the proper crystal frequency according to factory instructions. All proportions of the horizontal rate waveforms are adjustable by potentiometer control, permitting exact matching of this unit to other existing equipment, allowing test of apparatus under realistic operational conditions. Vertical proportions of Blanking, Drive and Sync are counted from the horizontal rate.

The synchronizing generator provides a composite Sync signal which includes front porch delays in the vertical and horizontal sync and serrations and equalizing pulses in the vertical sync interval. Special circuit card connections will provide an industrial sync waveform without equalizing pulses and serrations, or a military waveform which has no horizontal front porch or h-rate pulses in the V sync front porch interval. The generator normally develops an interlaced (2:1) television raster; special interconnects permit development of a 1:1 interlace (non-interlace) raster if desired.

Change of scan rate and pulse format is readily accomplished in this generator as explained in detail in the SCAN RATE CHANGE section.

Rate is determined by the count of horizontal lines to develop the television vertical fields and frame, as determined by the master oscillator frequency and count interconnects. Rapid change is possible by exchange of the SYNC COUNT card and crystal; less frequent change can be obtained by replacement of soldered jumper wires on the card.

TECHNICAL SPECIFICATIONS

SCOPE

This specification defines the electrical and mechanical characteristics of a unit which develops precise pulse trains as required to properly synchronize television cameras, display devices, special effect generators, etc. It is designed to provide waveforms as detailed by EIA Standards RS-170, RS-330, and RS-343. Adjustment is provided for all horizontal (h-rate) pulses. This permits operation at either the nominal value or anywhere within the tolerance region set forth by standards. Scan rate is selected automatically by front panel control.

ELECTRICAL CHARACTERISTICS

Functions - Development of precise trains for 2:1 interlaced television synchronzing.

Output Signals - One each of the following pulses:

Type	H Drive, V Drive, Blanking, Sync
Level . . .	4v. peak
Polarity . .	Negative going pulses
Impedance .	75 ohm source termination
Risetime . .	Nominally 0.1 usec.
Coupling . .	A. C. (capacitive)

Input Signal Requirements - None.

Controls - External - None

- Internal - H Front Porch
  H Sync Width
  H Blanking Width
  H Drive Width
  2H Serration Width
  2H Equalizing Pulse Width
  Pulse Amplitude

Scan Rates - Any two rates as selected, one at a time, by internal programming and front panel switch. Scan rates in common use are:

525/60	875/60	1023/60	1225/60
625/50	945/60	1029/60	Special

Other "non-standard" rates can be provided to customer specification at 2:1 interlace or 1:1 non-interlace ratios.

Waveform	- Internal circuit card jumper selection of Industrial, Military or Broadcast type waveform, including 2H Equalizing Pulses and Serrations where appropriate, in accordance with EIA Standards RS-170, RS-330 and RS-343.
Power Requirement	- D. C. voltages from parent unit, at the following nominal current values:

+5v. @ 500 ma +12v. @ 65 ma
-5v. @ 6ma +17v. unregulated @ 5ma

MECHANICAL CHARACTERISTICS

Enclosure	- Custom package for accessory installation in appropriate Signal Source CCTV Test Instruments.
Weight	- Approximately 4 lbs.
Operating Temperature Range	- 0°C to +50°C.

NOTE: In the interest of product improvement, these specifications are subject to change without notice.

MODIFICATIONS

This section contains a description of modifications or changes to instruments to conform to a particular customer's request or to correct documentation to include late revisions in circuitry configuration or components included to improve performance of the instrument.

INSTALLATION

Sync Source Accessory CCTV Sync Generators are supplied from the factory mounted inside the CCTV Test Instrument cabinet. Observe the instructions for installation of the parent unit prior to initial operation.

CONNECTIONS

Accessory units provide output pulses at the generator cabinet rear panel. The BNC cable connectors are marked as to function.

Outputs should be terminated properly to assure best pulse shape, without ringing or reflections. If the sync generator outputs are also used elsewhere, coaxial cable should be used to connect sync generator outputs (H Drive, V Drive, Blanking and Sync) to their point of utilization. All outputs are source terminated to drive 75 ohm coaxial cable such as RG-11/U or RG-59B/U.

All sync generator waveforms as used in pattern development are presented at front panel for reference, whether from internal or external source.

If the sync generator accessory is included, the instrument serial number will identify the type of accessory by option letter, for instance Signal Source 1203D. A separate instruction manual is provided for the accessory.

OPERATION

The Sync Source is ready to operate once power and signal connections are complete. Although the instrument was carefully calibrated at the factory prior to shipment, it was suggested that calibration be checked in accordance with the procedure outlined in this manual prior to initial operation.

OPTIONS IN OPERATION

Many operating modes are possible in the instrument in addition to those selected as "standard" to comply with most application requirements. Following is a summary of some other options which may be of interest. Many other operating conditions are possible. Please contact the factory for detailed information on implementation of these or other variations in operation.

1:1 INTERLACE (NON-INTERLACE)

While the "normal" television system operates at 2:1 interlace, some applications require no interlace (sometimes referred to as 1:1 interlace). This instrument can be configured, by harness wiring change, for 1:1 interlace operation on any scan rates, as desired. Caution is necessary in describing the rate desired, as discussed fully on page 15. This is a factory installed modification. Note that if a rate is changed to 1:1 interlace, this removes capability for 2:1 interlace operation for that rate.

OUTPUT COUPLING

Sync generator output pulses are provided at polarity, impedance, and levels as described by EIA Standards. There is no standard for direct coupling of sync generator output pulses, and therefore all outputs are a.c. coupled, unless otherwise specified, to prevent mismatch with other t.v. system equipment. Output pulses can be provided direct-coupled, by extensive modification is required. The customer must specify precisely the d.c. levels desired in the output signal. This is a factory installed modification.

OUTPUT SIGNALS

The synchronizing ("sync") generator produces pulses which are used to synchronize camera, display and other television devices in developing the t.v. raster. These pulses control the order in which the television picture will be produced. Four basic types of electrical pulse signals have become commonly used for such purposes, including H Drive, V Drive, Blanking and Sync, as described by EIA Standards RS-170, RS-330 and RS-343. All pulses are generated from a very stable master oscillator which is crystal controlled or accurately phase referenced to the power frequency; "Line Lock" is used to minimize the visibility of power line hum which may be introduced in television signal processing and distribution. Digital techniques are used to generate pulses at the horizontal and vertical rates of the scan rate to be used. These include:

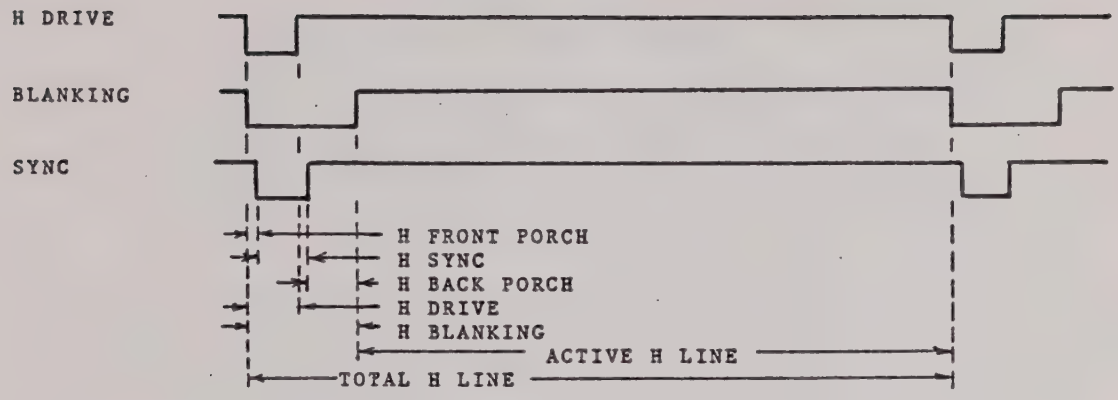
H DRIVE is a pulse train in which a pulse starts at the end of every television scanning line. Its function is to mark the time interval between the end of one line and the start of another; the pulses may be used to control horizontal deflection "flyback" and signal processing. The pulse train is continuous, uninterrupted even during the vertical synchronizing interval. These pulses are useful for synchronizing an oscilloscope when inspecting the television waveform at horizontal line rate.

V DRIVE is a pulse train in which a pulse starts at the end of each television field. Its function is to mark the time interval between the end of one television field and the next; these pulses may be used to control vertical deflection "flyback" and signal processing. These pulses are useful for synchronzing an oscilloscope when inspecting the television waveform at vertical field rate.

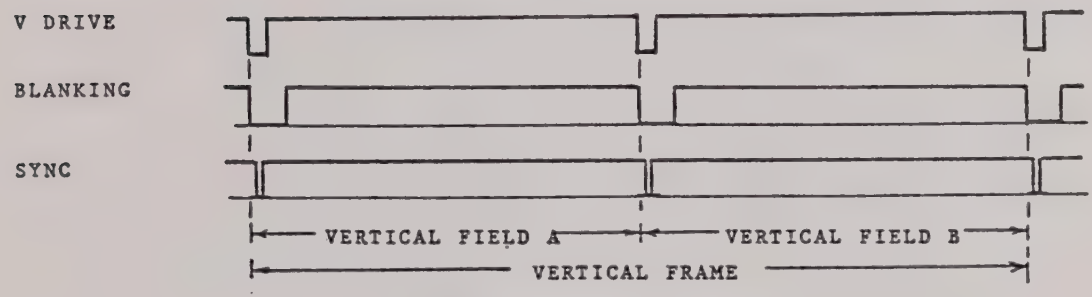
BLANKING is a mixture of horizontal and vertical information intended to control the "blackout" of the television system during deflection return between horizontal lines and vertical fields. These pulses are wider than Drives or Sync to insure that all transitions are made invisible.

SYNC is a complex combination of horizontal and vertical pulse information intended to control the decoding of a television signal by a display device, recorder or other type of video processing equipment. Usually it is mixed with the video information to produce a Composite Picture Signal which is distributed for general use.

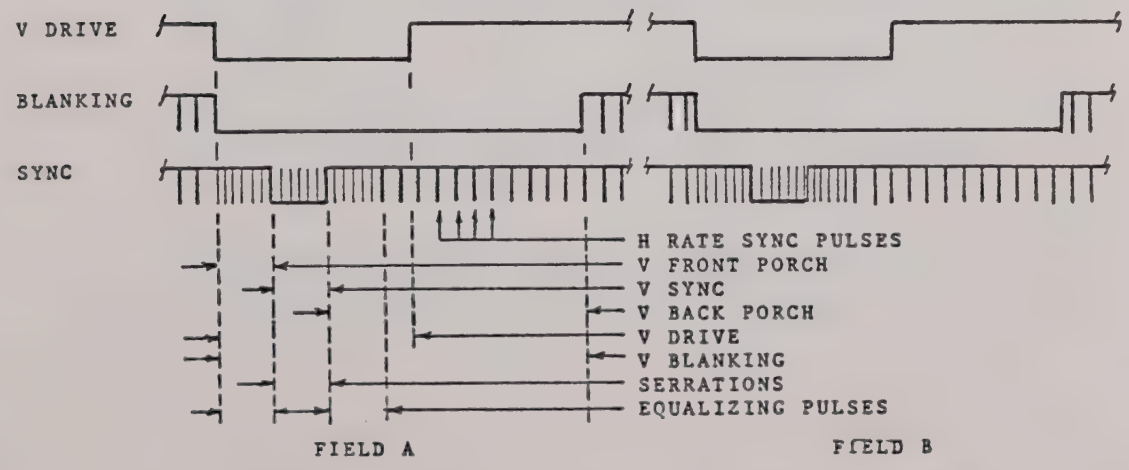
The description of a scan rate will specify the number of scanning lines per frame and the vertical field rate. Most television systems are "interlaced" to avoid a visible flicker in the display, usually a 2:1 ratio. Thus 2:1 interlace ratio



a. WAVEFORMS AT HORIZONTAL RATE



b. WAVEFORMS AT VERTICAL RATE



c. EXPANDED VIEW, DETAIL OF VERTICAL INTERVAL WAVEFORMS

Figure 1 – Typical Sync Generator Output Waveforms

means that two entire display "fields" must be developed to generate one "frame", or complete image. For example, the most common rate of 525/60 indicates that:

- There are 525 scanning lines per television frame.
- The field rate is 60 Hz. That is, one television field is developed in 1/60 second.
- Unless specified otherwise, it is assumed that the interlace ratio is 2:1. That is, the frame, a complete image, will be composed of two fields. Therefore, one frame is produced in 1/30 second. Each field will be composed of half the number of scanning lines per frame, in this example 262.5.

Scan rates in common use at this time for monochrome systems include 525/60, 625/50, 729/60, 875/60, 945/60, 1023/60, 1029/60, and 1225/60. The standard NTSC color system oeprates at the 525/60 rate with a phase-locked subcarrier at 3.579545 mHz (±20 Hz). This results in an actual vertical field rate of 59.94 Hz.

The format of H Drive, V Drive and Blanking is the same for all rates. The Sync waveform can occur in any one of three formats, according to application requirements:

BROADCAST-type sync with 2H rate Equalizing Pulses for three scanning line intervals (6 pulses) before and after the vertical sync interval, 2H rate Serrations during the three-line vertical sync interval (6 pulses), and horizontal front porch as specified in EIA Standard RS-170 and shown as optional in EIA Standards RS-330A and RS-343A.

INDUSTRIAL-type sync the same as above, without Equalizing Pulses and Serrations, per EIA Standards RS-330A and RS-343A.

MILITARY-type sync which does not include Equalizing Pulses or Serrations, has no horizontal front porch, and no horizontal rate pulse information during the vertical front porch of three scan line duration.

Horizontal rate pulses are adjustable so the waveform can be matched exactly to the desired operating format. Vertical pulse proportions must be synchronous with the horizontal scan lines, and therefore are determined by digital count, adjustable by count selection.

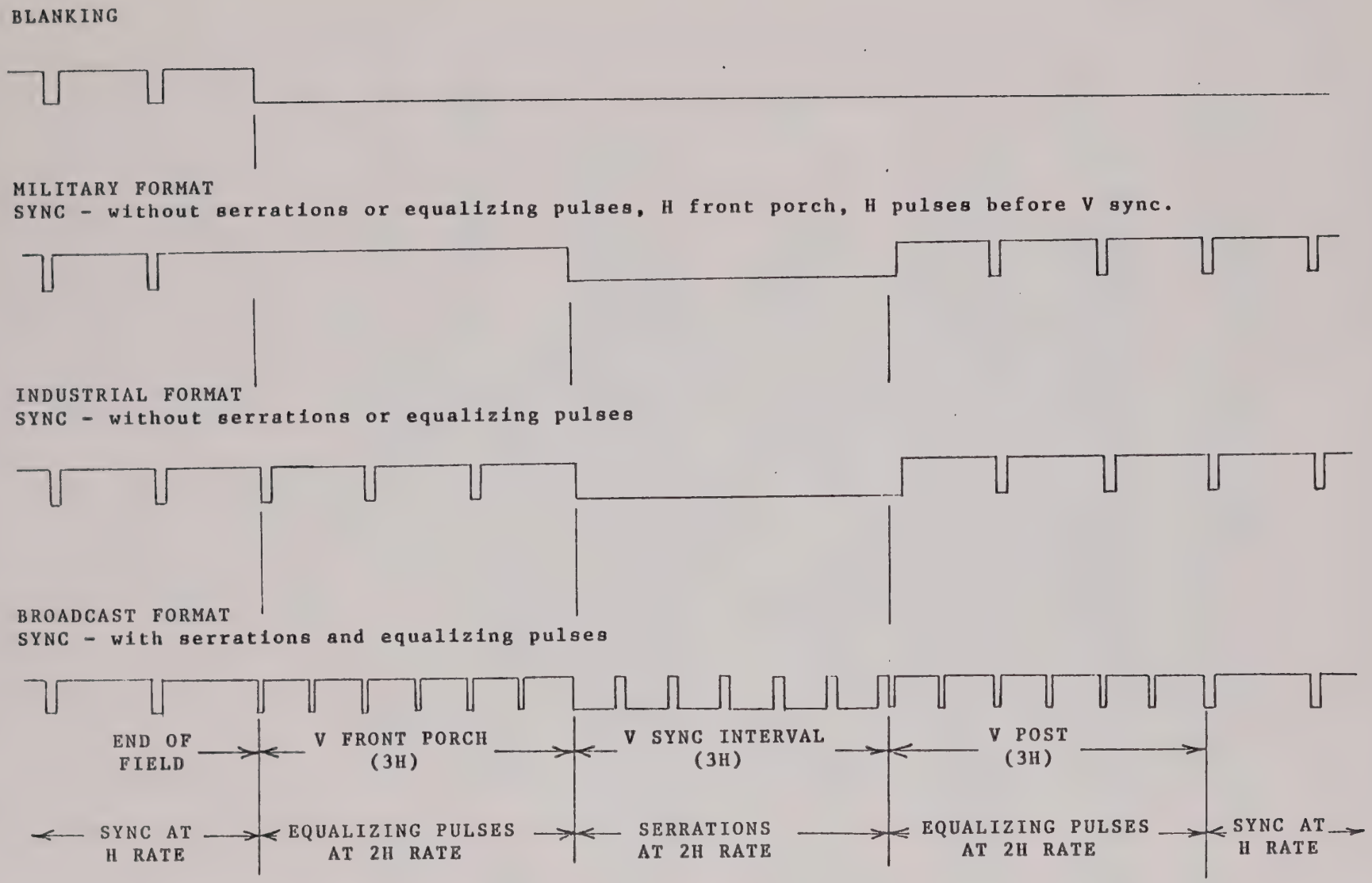


Figure 2 - Detail of Vertical Sync Interval

Television operation at so-called 1:1 interlace, or non-interlace, is becoming more prevalent. Care must be taken in describing such operation to avoid confusion. As noted above, two "fields" make a "frame" in the commonly used 2:1 interlace systems.

This practice has carried over in description of 1:1 interlace in some cases, specifications assuming two identical fields per frame. In other cases, it is assumed that, since fields are identical, one "field" makes a "frame".

To clarify specification of scan rates, it is assumed that the number of scan lines necessary to develop a complete image make a "frame". Thus a 1:1 interlace (or non-interlace) system will have one "field" per "frame". The 2:1 interlace system will have two "fields" per "frame". For example:

SCAN RATE	SCAN LINES PER FRAME	SCAN LINES PER FIELD	FIELD RATE	FRAME RATE
525/60/2:1 interlace	525	262.5	60 Hz	30 Hz
525/60/1:1 interlace	525	525	60 Hz	60 Hz

There must be a whole number of scanning lines in each field for 1:1 interlace, whereas to obtain 2:1 interlace each field must have a half line. For example, often it is desired to develop a non-interlace condition for the common 525/60/2:1 interlace system. This may be done by adding a one-half line to the field, resulting in:

	SCAN LINES PER FRAME	SCAN LINES PER FIELD	FIELD RATE	FRAME RATE
ORIGINAL SYSTEM 525/60, 2:1 interlace	525	262.5	60 Hz	30 Hz
MODIFIED SYSTEM (1:1 interlace)	526? (263)	263	59.88 Hz	29.94 Hz? (59.88)

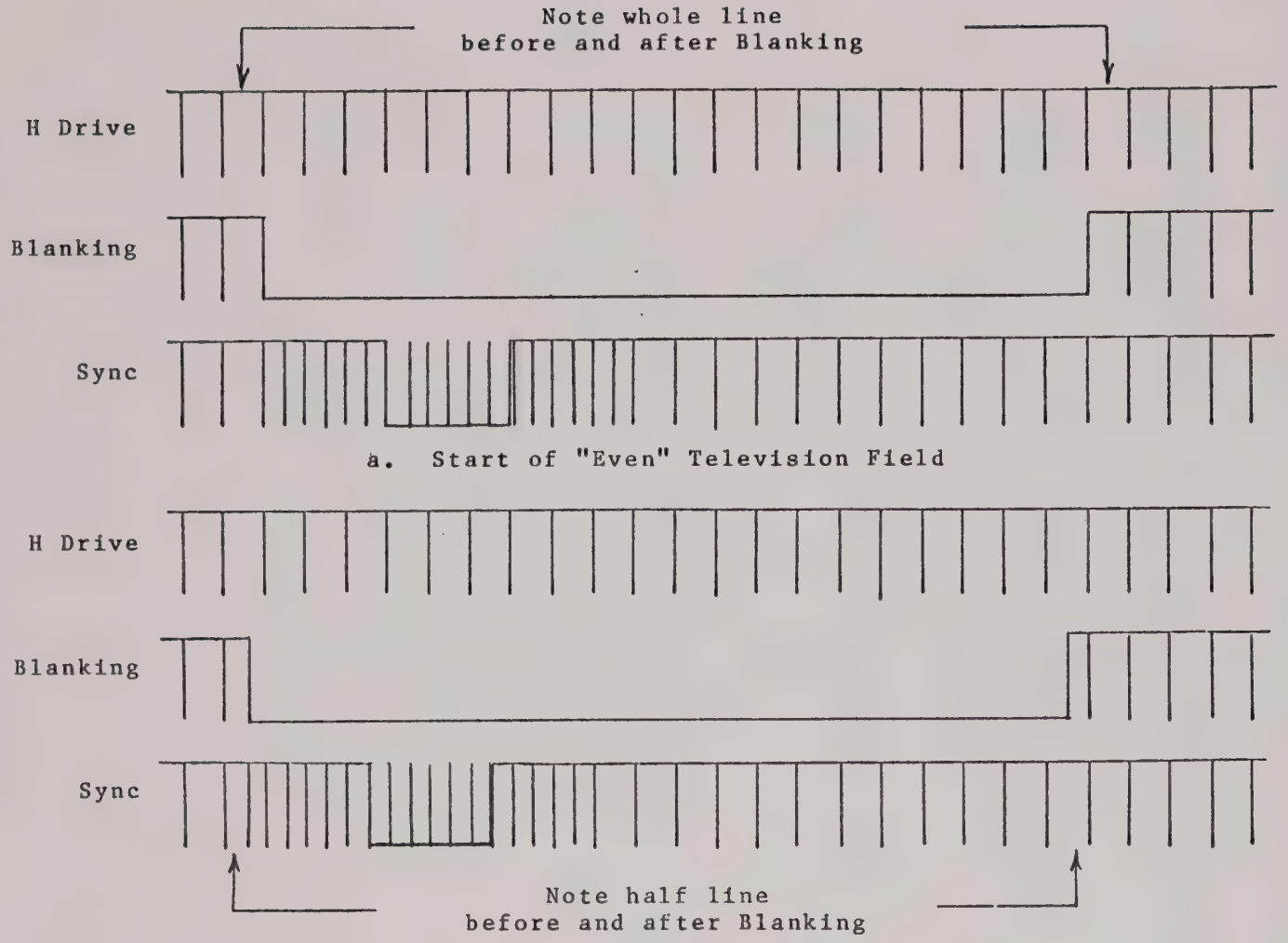


Figure 3 - Detail of 2:1 Interlace

Television operation at so-called 1:1 interlace, or non-interlace, is becoming more prevalent. Care must be taken in describing such operation to avoid confusion. As noted above, two "fields" make a "frame" in the commonly used 2:1 interlace systems.

This practice has carried over in description of 1:1 interlace in some cases, specifications assuming two identical fields per frame. In other cases, it is assumed that, since fields are identical, one "field" makes a "frame".

To clarify specification of scan rates, it is assumed that the number of scan lines necessary to develop a complete image make a "frame". Thus a 1:1 interlace (or non-interlace) system will have one "field" per "frame". The 2:1 interlace system will have two "fields" per "frame". For example:

SCAN RATE	SCAN LINES PER FRAME	SCAN LINES PER FIELD	FIELD RATE	FRAME RATE
525/60/2:1 interlace	525	262.5	60 Hz	30 Hz
525/60/1:1 interlace	525	525	60 Hz	60 Hz

There must be a whole number of scanning lines in each field for 1:1 interlace, whereas to obtain 2:1 interlace each field must have a half line. For example, often it is desired to develop a non-interlace condition for the common 525/60/2:1 interlace system. This may be done by adding a one-half line to the field, resulting in:

	SCAN LINES PER FRAME	SCAN LINES PER FIELD	FIELD RATE	FRAME RATE
ORIGINAL SYSTEM 525/60, 2:1 interlace	525	262.5	60 Hz	30 Hz
MODIFIED SYSTEM (1:1 interlace)	526? (263)	263	59.88 Hz	29.94 Hz? (59.88)

CIRCUIT CARD AND CONTROL LOCATIONS

CABINET LAYOUT

This instrument is packaged in a laboratory cabinet suitable for bench or rack mount use. It can contain two or three card files, including from 44 to 66 circuit cards, 22 per section. Text description is based upon orientation as outlined below.

In some instruments, Section A is used for optional accessories only and may not be included if options are not installed. This provides as small a cabinet as possible for all configurations.

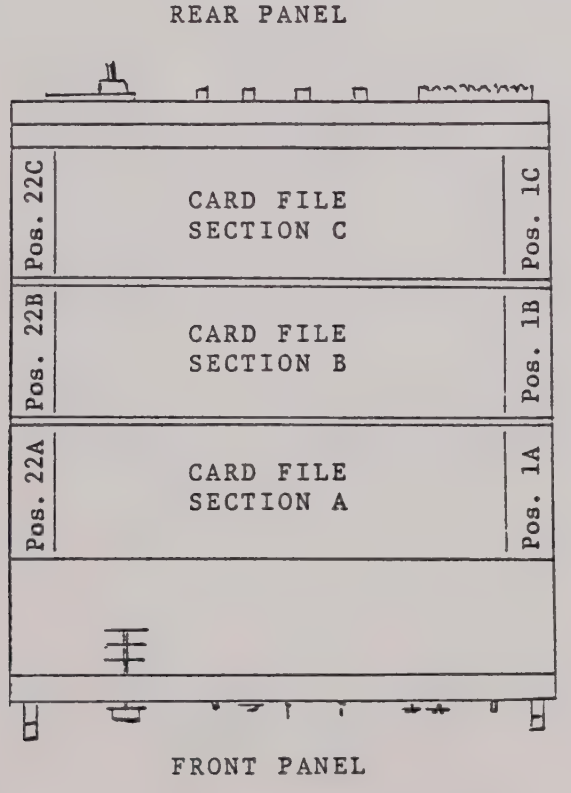


FIGURE 4 - Top View of Instrument

CIRCUIT CARD LOCATIONS

Circuit cards in the Sync Source 1302 accessory are located in the positions listed below. The sync generator package is installed in the circuit card file immediately behind the front panel of the parent unit (Section A). Remove the generator top cover for access to internal controls.

Insertion of cards into the improper slot may casue damage and, of course, the generator will be inoperative. Be sure to reinsert circuit cards into the correct location if they are removed, and establish that they are firmly seated into the connector. Cards are keyed so they cannot be inserted backwards; an attempt to force them in the wrong way will result in a broken connector.

SECTION A (FRONT)

Pos.	Dwg. No.	Group	Name
11	L-2003	2	Pulse Output
12	L-2024	1	Sync
13	L-2026	8	Drive/Blanking
14	L-2025	*	Sync Count
15	L-2024	1	Sync
16	L-2026	8	Drive/Blanking
17	L-2025	*	Sync Count

INTERNAL CONTROL LOCATIONS

The circuit cards may vary in orientation for various instruments. Therefore, the description of control locations has been standardized as to location on the circuit card itself.

Locations are keyed to the circuit card as viewed from component side, connectors down, as shown below:

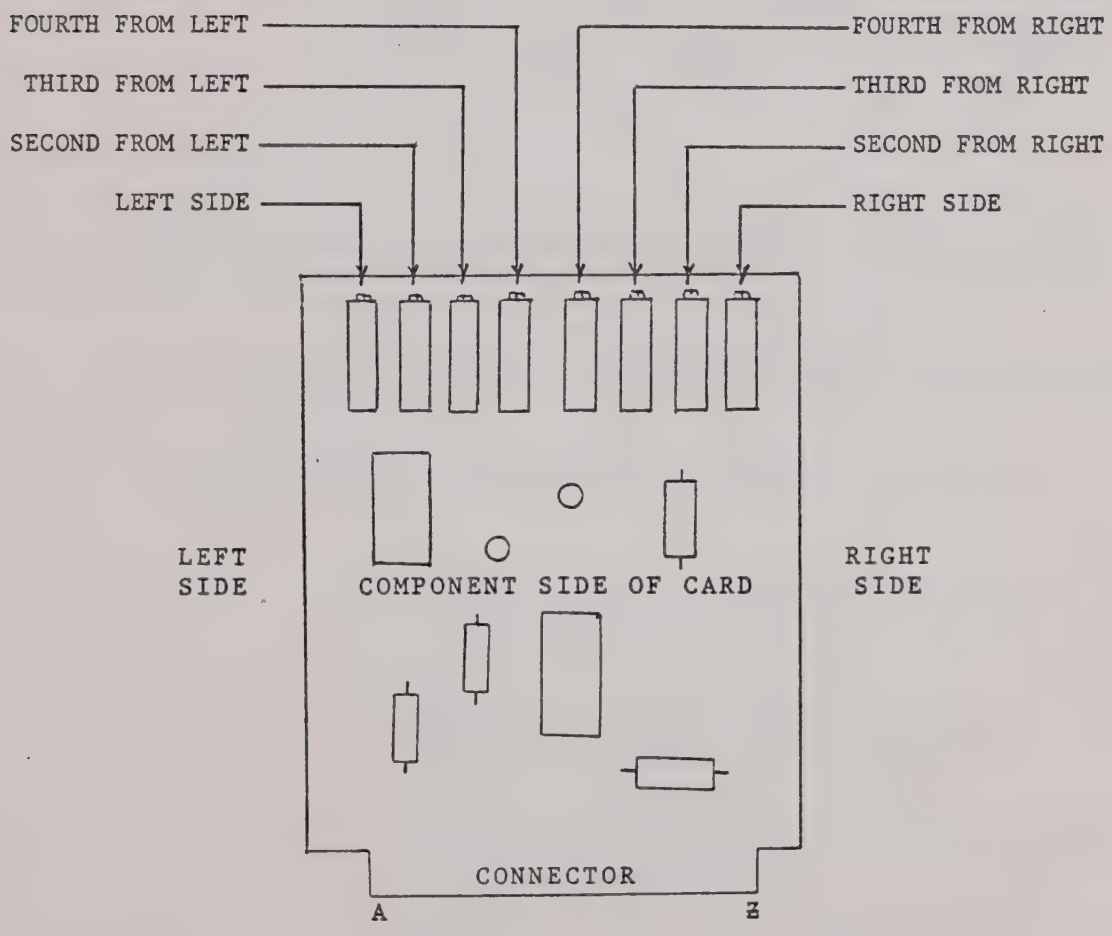


FIGURE 5 - Circuit Card Control Orientation

CONTROLS AND ADJUSTMENTS

EXTERNAL CONTROLS (Front Panel)

SCAN RATE - Switch which selects scan rate as indicated by push button selectors.

SYNC WAVEFORM FORMAT - Toggle switch selection of the Broadcast sync waveform format (with 2H rate equalizing pulses and serrations in the vertical sync interval) Industrial, or Military format.

INTERNAL CONTROLS

Access to internal controls is achieved by removal of the generator top cover; remove eight flathead screws and lift the cover from the unit. If necessary, remove the unit from racks for this access to the interior of the instrument.

The 1302 contains two sets of circuit cards for adjustments of the two scan rates. These cards share common POWER REGULATOR and PULSE OUTPUT cards.

Internal controls are located on the circuit cards as shown in Figure 5.

MASTER OSCILLATOR - The Master Oscillator (located on the DRIVE/ BLANKING card) is crystal-controlled and does not require adjustment.

H FRONT PORCH - The control at the left edge of the SYNC card will adjust the width of "front porch" in the horizontal sync.

H BLANKING - The potentiometer second from the left edge of the DRIVE/BLANKING card controls width of the H Blanking pulse.

H DRIVE - The control at the left edge of the DRIVE/ BLANKING card is used to adjust width of the H Drive pulse.

H SYNC - The potentiometer third from the left side of the SYNC card controls width of the Horizontal Sync pulse.

2H SERRATIONS - The control second from the left edge of the SYNC card controls the width of serration that will be introduced into the sync signal during the vertical sync interval.

EQUALIZING PULSES - The control fourth from the left edge of the SYNC card adjusts width of Equalizing Pulses which occur prior to and immediately after the V Sync interval.

PULSE AMPLITUDE - The control at the right edge of the PULSE OUTPUT circuit card adjusts simultaneously the amplitude of output pulses (H Drive, V Drive, Blanking and Sync) over a range of 3.5v. to 4.5v. peak-to-peak when properly terminated. Nominal setting should be 4.0v. peak-to-peak.

SCAN RATE CHANGE AND SYNC FORMAT

This instrument has been designed for operation at various scan, field and frame rates at 2:1 interlace. This includes all rates specified by American EIA Standards RS-170, RS-330 and RS-343 which specify field and frame rates at 60 Hz and 30 Hz respectively, plus European rates which employ a 50 Hz field rate and 25 Hz frame rate, and other non-standard rates.

Operation in a non-interlaced condition (1:1) is possible with proper jumper connections on the SYNC COUNT card. Contact the factory if further details are desired.

Instrument control ranges are designed to cover the ranges required by EIA Standard scan rates; components are stocked by the factory for these rates. Commonly used pulse proportions are shown on Table I, page 17. Contact the factory if non-standard scan rates are desired.

A scan rate is determined by the number of scan lines per field and the desired field repetition rate. The master oscillator frequency determines the rate at which horizontal lines are developed and that, in turn, determines what the frequency or repetition rate of the television field will be. By definition of 2:1 interlace, two fields constitute a frame; a frame is defined as one complete presentation of raster information. Therefore, the designation of 525/60/30 indicates that:

a. There will be 525 horizontal scan lines per frame.

b. The field rate shall be 60 Hz.

c. The frame rate shall be 30 Hz.

d. The ratio of field repetition rate to frame repetition rate determines the interlace ratio will be 2:1, which indicates that there will be two fields per frame, each field containing one-half of the total scanning lines - in this case 262.5.

The following information must be known before scan rate change can be accomplished:

1. Frame rate or Field rate

   Frame rate equals field rate divided by the interlace ratio.

   Example: If using 525-line scan rate, 60 Hz field rate, 2:1 interlace then:

   60 Hz field rate ÷ 2 = 30 Hz frame rate

2. Scan lines per field

Scan lines per field equal scan lines per frame divided by interlace ratio.

Example: At the 525-line scan rate, interlaced 2:1:

525 ÷ 2 = 262.5 lines per field

This is the count which must be developed in the sync generator circuitry to develop vertical rate pulses from horizontal information.

The count must be determined in binary sequence as follows:

262.5
- 256.0 (largest possible binary integer)
6.5
- 4.0 (next largest possible binary integer)
2.5
- 2.0 (next largest possible binary)
.5 (obtained automatically from reset)

The numbers subtracted, 256, 4, and 2, are the binary count sequence which will total 262 and an additional count of 0.5 is obtained from counter reset. See Table I which has the information for standard and commonly used rates. See CONTROLS AND ADJUSTMENTS for access to circuit cards.

3. Master Oscillator Frequency

Master oscillator frequency is twenty times horizontal rate. Horizontal rate is the field rate multiplied by the number of lines per field or frame rate multiplied by the number of lines per frame.

Example: At the 525/60 scan rate:

H rate = frame rate x no. of lines per frame

30 x 525 = 15,750 Hz

20H rate = 20 x 15,750

20H = 315,000 Hz or 315.00 kHz

Master oscillator frequency = 315.00 kHz

CAUTION

When removing and replacing jumpers on printed circuit cards, do not overheat card and lift printed circuit card copper pads. Use a vacuum device to remove solder before existing jumper is removed. Jumper removal and replacement must be done by those experienced with printed circuit cards. Damage to printed circuit cards caused by improper methods will void the warranty.

Procedure to change scan rate (See Table I)

1. Insert the crystal of proper frequency (determined in step 3) into DRIVE/BLANKING circuit card.

2. Install jumpers on SYNC COUNT circuit card per drawings L-2025 and L-2025-C to count the number of t.v. lines per field.

3. Vertical pulses are counted from horizontal lines; therefore, pulse widths may be adjusted as desired by wire jumper changes. Install jumpers on SYNC COUNT card for proper V pulse width (Blanking + V Drive) as shown on drawings L-2025 and L-2025-C. Pulse widths are as listed in Table I.

The Sync signal waveform may be presented in any one of three formats consistent with the scan rate being used:

a. Broadcast-type sync with 2H rate Equalizing Pulses for three scanning line intervals (6 pulses) before and after the vertical sync interval, 2H rate Serrations during the three-line vertical sync interval (6 pulses), and horizontal front porch as specified in EIA Standard RS-170 and shown as optional in EIA Standards RS-330A and RS-343A.

b. Industrial-type sync the same as above, without Equalizing Pulses and Serrations, per EIA Standards RS-330A and RS-343A.

c. Military-type sync which does not include Equalizing Pulses or serrations, has no horizontal front porch, and no horizontal rate pulse information during the vertical front porch of three scan line duration.

Selection of the desired waveform is accomplished by placement of jumpers on the SYNC card as itemized in PERFORMANCE VERIFICATION AND CALIBRATION.

PERFORMANCE VERIFICATION AND CALIBRATION

Sync Source generators operate automatically, developing an analog television signal through digital techniques. Therefore, no extensive calibration is required, unless component replacement is undertaken. Internal controls are provided for horizontal rate pulse widths. These are to be adjusted as desired for the particular application of the equipment, and should be checked if any components in the cards are replaced. Also, their values should be readjusted if another card is inserted into the unit.

Vertical timing is controlled by the counter circuits and, therefore, is automatically locked to the horizontal rate. Pulse proportions can be adjusted by internal wiring modification; please contact the factory if such adjustment is desired.

1. Any good, general purpose oscilloscope with adequate high frequency response is suitable for inspection of the waveforms. Calibration of the Sync Source 1302 requires an oscilloscope response that is flat (±0.5db) to greater than 30 mHz to show complete detail of risetime. Direct coupling (d.c.) is preferred to prevent false appearance of a tilt on the video waveform at vertical rate. The oscilloscope should have provisions for external synchronization from either Horizontal or Vertical Drive to view the composite video output waveform with convenience. Also, a Delaying sweep capability will permit inspection of selected horizontal lines within the vertical television field. Typical instrumentation suited for this use would be the Tektronix Type 453 or equivalent.

2. A UG-274/U BNC series coaxial cable tee and 75 ohm termination, Dage 540-2 or equivalent.

3. A minimum of two coaxial cables, RG59B/U, no more than three feet in length with BNC connectors.

Voltage Levels

Power supply levels in the parent unit should be closely adjusted at the POWER REGULATOR cards to +5v. and -5v. to establish proper reference levels for all operations. Test points are provided on the POWER REGULATOR cards as shown in Drawing L-2001. Then proceed to the itemized procedure as listed on the next page.

An accurate voltmeter (±1%), either direct reading needle movement or digital readout, may be used to monitor power supply levels at the POWER REGULATOR card.

Calibration Procedure

The Sync Source 1302, Dual Rate television synchronizing generator accessory provides either of two scan rates, selected by front panel switch. The two sets of circuit cards can be programmed individually to provide the two scan rates and waveform formats of interest. Calibrate each scan rate separately using the proper set of circuit cards for the adjustments required.

Vertical timing is controlled by the counter circuits, and therefore is automatically locked to the horizontal rate. Pulse proportions can be adjusted by internal wiring modification; refer to SCAN RATE CHANGE section if such adjustment is desired.

1. Select SCAN RATE A at the front panel. Refer to Table I for proper timing relationships for the scan rate in use. See Figures 1 and 2 for conformance to typical waveforms. The circuit cards at the front of the instrument are used to develop the signals for this scan rate.

2. Sync the oscilloscope from the leading edge (-) of H Drive. Set oscilloscope sweep rate as desired for inspection of timing as described in each step of adjustment.

3. Observe the H Drive waveform at the rear panel. Pulses should be 8 volts, pk-pk (unterminated) negative going with edges spaced as shown on Table I for the various scan rates (63.4 usec. at the 525-line rate). Adjust the pulse width to the proper value by use of the control at the left edge of the DRIVE/BLANKING card.

4. Observe the Blanking output, with oscilloscope sync remaining at H Drive. Observe amplitude, polarity and leading edge spacing to be as described above. Adjust H Blanking pulse width by use of the control second from the left edge of the DRIVE/BLANKING card.

5. Sync the oscilloscope from the leading edge (-) of V Drive. Observe the V Drive waveform and check polarity, level and width (nominally 667 usec.). The pulses should be spaced 16,667 usec. apart, occurring at a 60 Hz rep rate (20 msec. apart, occurring at a 50 Hz rep rate for the 625/50 scan rate). For 60 Hz field rates, switch stationary or drift very slowly to the right or left. A rapid travel or apparently out of sync signal indicates that the vertical rate is incorrect, due to improper master oscillator frequency or improper line count.

6. Observe the Blanking output and check level, polarity and width of the V Blanking interval (20 lines, 1268 usec. at 525-line rate). The H Blanking pulses (as adjusted in step 4) should be present at all times <u>except</u> during V Blanking interval. The upper and lower baselines should be uniform with no tilt, sag or modulation.

7. Sync oscilloscope to the leading edge (-) of V Drive. Set oscilloscope sweep at 2 msec/div.

   Observe the SYNC OUTPUT and inspect for proper waveform. The sync waveform may be presented in any one of three formats (as described on page 27) by the selection of jumpers on the card.

   Format is controlled by jumpers 4, 5, 6 and 7 as shown on drawings L-2024 and S-2024. Normally all jumpers are installed to provide the Broadcast format, which includes equalizing pulses and serrations in the vertical sync interval, and a horizontal front porch in the Sync signal.

   To develop the Industrial format, no serrations or equalizing pulses, cut out jumpers 4 and 6.

   To develop the Military format, with no serrations or equalizing pulses, no horizontal information in the three lines preceding vertical, and no horizontal front porch, remove jumpers 4, 5, 6 and 7.

   If the sync waveform does not appear to be as expected, be sure to check which jumpers are installed on the SYNC card.

   This procedure assumes the use of Equalizing Pulses, Serrations and horizontal Front Porch. If they are not used, the procedure should be varied accordingly. Note presence of positive serrations in the V Sync Interval (from 3H to 6H past V Drive leading edge, from 190 usec. to 380 usec. at 525-line rate) if they are used. It may be necessary to expand the sweep for this observation; delaying sweep at approx. 50 usec/div. also will permit convenient viewing of the V Sync interval. Six serration pulses should be present in the V Sync interval (occurring at 2H rate).

   Observe that six Equalizing pulses are present before and after the V Sync interval, if used, also at 2H rate (spaced 31.70 usec. for 525-line rate). Do not adjust pulse widths at this time.

8. Continue to observe the SYNC output. Sync oscilloscope from the leading edge (-) of H Drive, sweeping scope at a convenient rate to show the H Sync pulses.

9. The serrations will appear as a faint trace of positive pulse half way between the H Sync pulses. Adjust the control second from the bottom edge of the SYNC card for proper serration pulse width. The trailing edge of this pulse is the leading edge of H Sync.

   NOTE: Gross misadjustment of the SYNC card can cause an apparent loss of horizontal front porch, particularly if the front porch adjustment is longer than serration timing. Should this occur, adjust the Front Porch control to minimum and Serration control to maximum pulse lengths. Front Porch should then appear; complete adjustments in manner described on the next page.

10. Adjust the front porch (leading edge delay) by use of the control at the left edge of the SYNC card. Then adjust the width of H Sync pulse by use of the control third from the left edge of the SYNC card. Adjust Equalizing pulse width by use of the control fourth from the left edge of the SYNC card (Equalizing pulses will appear as a faint trace inside the H Sync pulse outline).

11. Adjust the output amplitude of the output pulses to the desired level, nominally 4v. peak. Note that the amplitude adjustment at the right edge of the PULSE OUTPUT card controls all output pulses simultaneously.

12. Select SCAN RATE B. Repeat steps 3 through 10 for calibration of the second scan rate, checking that all pulse rates are proper for that scan rate. Circuit cards at the rear of the instrument are used for development of signals at this rate.

TROUBLESHOOTING

This Sync Generator has been designed to provide the greatest reliability possible in the normal laboratory environment. Unfortunately some components, particularly capacitors and semiconductors, exhibit a limited lifetime, and lead to the possibility of component failure. In this instrument the components are derated to assure the longest possible lifetime; proper operation should be expected for at least a five year and probably ten year period.

Be sure to check the calibration procedure to establish that failure has occurred definitely. Often a symptom of difficulty can be traced to improper adjustment of the unit.

Failures which would occur relatively early, within one to two years, are most likely due to semiconductor (transistor) failure due to internal contamination at the time of manufacture or due to defective solder joints in assembly. Failures occurring at later times statistically would be attributed to electrolytic capacitor failure due to internal chemical reaction.

In rare instances, there may appear in this equpiment a deviation from the part as called out on the schematic and in the parts list. This is especially true in the case of semiconductor devices, diodes and transistors, where a number of types are interchangeable. The right is reserved to make use of interchangeable components where such substitution will provide equal or superior performance to that specified. It is suggested that if replacements are required, the type specified in the parts list be procured.

You are urged to read the instruction manual completely before connecting the Sync Source generator for operation. Observance of only a few procedures will provide greater operator convenience and will assure most effective application of the equipment as well as provide maximum safety to the user.

CAUTION

Even low voltages commonly present in transistorized circuits are potentially dangerous. Additionally, full line voltage is present on fuse terminals, power switch terminals and other exposed points within the interior of the unit, and are accessible when the cover of the equipment is removed. Caution should be exercised, as follows:

a. Remove power by unplugging the line cord when removing covers and inspecting interior of the unit.

b. Observe the common safety practices when servicing equipment (dry skin, insulation of the body from ground, etc.).

c. Never work on electrical equipment when alone.

Fault isolation can be achieved most efficiently by determining the circuit card module causing difficulty, from symptoms in the output waveforms.

a. With power applied to the unit, the power switch turned to the ON position, the pilot light should be lit. If it is not, check the fuse (located on the rear panel). If the pilot light is lit, but all sync generator waveforms are missing, check all internal d.c. power levels (+5v., -5v. and +12v). If the +12v. supply and PULSE OUTPUT card level control are operating properly, check that the master oscillator on the DRIVE/BLANKING card is operating properly. If so, check operation of the H front porch monostable multivibrator on the DRIVE/ BLANKING card.

b. If pulse timing and format appear correct but amplitude is not proper, check the PULSE OUTPUT card output stages and pulse level control. If only one waveform is missing or has improper level, check the appropriate output section of the PULSE OUTPUT card.

c. If H Drive is proper, but V Drive, Blanking and Sync are improper at vertical rate, check the vertical count programming and operation, SYNC COUNT card.

d. If H Drive and/or horizontal rate Blanking pulses are missing or occur at 2H rate, but V Drive is proper, check the 2:1 count on the SYNC COUNT card.

e. If the H Drive or Horizontal rate Blanking pulses are of incorrect width, or erratic, check the DRIVE/BLANKING card circuitry.

f. If the V Drive or vertical rate Blanking pulses are improper, but H Drive and Sync waveforms are normal, check circuitry on the SYNC COUNT and DRIVE/BLANKING cards.

g. If only the Blanking waveform is abnormal, but amplitude is correct, check mixing circuitry on the DRIVE/BLANKING card.

h. If the Sync waveform only is improper in format or timing but amplitude is proper, check circuitry on the V SYNC card.

Operation of each of these cards is discussed in detail under CIRCUIT DESCRIPTION; refer to the appropriate paragraphs after fault isolation as described above.

LIMITED WARRANTY

Signal Source equipment is guaranteed to be free of defects in material and workmanship for a period of one year from date of shipment, when operated in accordance with the instructions and specifications provided. Such limited warrant is made in lieu of any other guarantee or warranty, expressed or implied, and is offered only to the original purchaser. If such defects are confirmed through our inspection, the product will be repaired or replaced, at our option, without charge to the purchaser for parts or for labor. This warranty does not cover damage which occurs in shipment or due to misuse or abuse of the apparatus, and is not applied to cables or decorative, stained or painted finishes.

Those requesting adjustment through the terms of this warranty are instructed to contact the factory for authorization to return the equipment before shipment. Items for which authorization is issued are to be sent prepaid.

Signal Source equipment is designed and constructed using the most effective and safest industrial practice known, and in accordance with printed and accepted practices for fabrication of industrial electronic equipment. Inasmuch as Visual Information Institute, Inc. has no control over the manner in which the instrument is used, or over systems into which the equipment will be interconnected, the corporation cannot and does not assume any liability for circumstances or damages arising from use of this equipment.

This warranty does not apply to equipment which has been modified in any way to other than the original factory configuration.

CAUTION

When removing and replacing jumpers on printed circuit cards, do not overheat card and lift printed circuit card copper pads. Use a vacuum device to remove solder before existing jumper is removed. Jumper removal and replacement must be done by those experienced with printed circuit cards. Damage to printed circuit cards caused by improper methods will void the warranty.

ACCESSORIES AND SERVICE

Vii products are designed for long, reliable service under adverse operating environments. It should require a minimum of maintenance or service if properly applied.

We stand ready to assist in advising as to proper application of our products, to aid in servicing instruments, and to help in CCTV system layout and operation for maximum of utility in the application of television of all areas.

A number of accessories are available for extended operation of Signal Source equipment, including special housings, cables, etc., especially designed to suit unusual requirements. Special configurations of Signal Source generators are available for integration into existing or contemplated systems, such as units without cases, special accessory functions brought to the front panel, etc.

If your equipment should malfunction or develop operating difficulty, the factory offers a service and overhaul program for a labor fee plus cost of parts, transportation and insurance. Prompt attention to your equipment is pledged; do not hesitate to contact the factory in these instances.

CIRCUIT DESCRIPTION

The Sync Source 1302 develops precise synchronizing signals for use in industrial, educational and laboratory television applications. The waveform format is in accordance with EIA Standards RS-170, RS-330 and RS-343 for synchronizing signals. The signals are synthesized through modern digital techniques; the latest integrated circuits are used to develop precise synchronizing signals. All power supplies are closely regulated to insure dependable, stable operation over wide variations in ambient conditions. Basically this instrument consists of two separate sets of circuitry sharing common power and output circuitry. The set of circuits to be used at any one time is selected by routing of d.c. control voltage to the proper circuit section.

The sync generator follows the fundamental pattern employed for such devices for some time. The traditional format is used to permit flexibility in application; the output pulses can be adjusted to operate at the nominal values called out by current standards or elsewhere within or exceeding the prescribed tolerance range. Also the one set of circuit cards is operable at all recommended scan rates without major circuit alteration. Therefore, the instrument easily can be made to match any system to which it is applied.

In order to provide interlace, the master oscillator operates at a multiple of twice horizontal (2H) rate. The serrations and equalizing pulses are developed directly from this master timing reference, at the 2H rate. From this point, the master timing pulses are divided by count to generate horizontal (H) rate and vertical (V) rate pulses. Horizontal rate pulses are adjustable to allow operation at various formats as required for different scan rates. Vertical rate pulses are established by scan line count.

The 2H timing reference is used to develop the serration pulse, and also a front porch pulse somewhat shorter than the serration width to act as a timing reference for blanking and drive pulse leading edges.

The 2H front porch pulses are submitted to a 2:1 count to develop H-rate timing reference for generation of Blanking, H Drive and H Sync; these particular pulses are generated by individual monostable multivibrators on their respective circuit cards.

These 2H rate pulses are also submitted to a counter which develops the vertical (V) rate. This circuit develops a V Reset which acts as the trigger to generate vertical

pulses which signify the end of a television field (two fields constitute a frame which is one complete presentation in the vertical dimension of the television raster). Interconnections are provided on the SYNC COUNT card to determine the number of horizontal lines in the frame.

Vertical pulses, initiated by the V trigger, are controlled for proper width by count of horizontal lines. A matrix is included on the SYNC COUNT card to control width of the V Blanking and V Drive pulses. The V Sync pulse is at all times delayed by a 3H front porch from the start of V Blanking, and always is 3H (the time of three horizontal lines) in width.

The sync generator develops precise synchronizing signals for use in industrial, educational and laboratory television applications. The waveform format is in accordance with EIA Standards RS-170, in that it provides equalizing pulses and horizontal rate serrations in the vertical sync interval. It meets all requirements of RS-343, RS-170 and RS-330 standards for synchronizing signals. The signals are synthesized through modern digital techniques; the generator circuits are completely transistorized, composed of multivibrators which employ high speed switching transistors. All power supplies are closely regulated to insure dependable, stable operation over wide variations in ambient conditions.

DETAILED CIRCUIT DESCRIPTION

The Sync Source 1302, dual rate television synchronizing generator, provides either of two scan rates, selected by front panel switches. The two sets of circuit cards can be programmed to provide the two scan rates of interest. The set of cards (SYNC COUNT, DRIVE/BLANKING and SYNC) used is selected by switching +5v. B+ voltage to the proper set to be used for the scan rate desired. The outputs are mixed at the PULSE OUTPUT card.

The master oscillator circuitry develops a pulse train from a stable crystal-controlled oscillator circuit whose risetimes act as the timing reference for generation of all waveforms. The crystal-controlled master oscillator is located on the DRIVE/BLANKING card (Z1), operating at 20 times the horizontal rate. Provision is made for selection of an alternate master oscillator source instead of Crystal (not used in this instrument) by gates Z2C and Z2D. The 20H pulses are counted down to 2H by counter Z3.

EIA Standards RS-170, RS-330 and RS-343 require that serrations of horizontal rate be produced during the vertical sync interval. Serration polarity is opposite that of the horizontal pulses to permit detection of the vertical sync.

Therefore, the negative trailing edge of the serration pulses becomes a sync timing reference as opposed to the negative leading edge of the horizontal sync pulses. Therefore, the 2H pulses from the master oscillator are routed to a monostable multivibrator where a delay is produced to generate the serration pulse width. From this point on, the trailing edge of the serration pulse is used as the sync timing reference. However, the leading edge of blanking must take place previous to the timing reference. Therefore, a second monostable multivibrator develops a time delay to generate the proper start of blanking. This control establishes the width of horizontal front porch (time from start of blanking to start of sync).

The 2H pulses are routed to the Serration monostable (Z9, 74121) and Front Porch monostable (Z10, 74121) on the SYNC card. The front porch pulse trailing edge becomes the timing reference for horizontal and vertical blanking. Integrated circuit counter Z5B on the SYNC COUNT card (2:1 count, ½ 7473) develops the H rate timing reference submitted to the H Drive monostable (Z7, 74121) and to the H Blanking monostable (Z8, 74121) and to the H Blanking monostable (Z8, 74121) on the DRIVE/BLANKING card.

Development of an interlaced synchronizing waveform requires that the vertical information be counted from the horizontal. Therefore, the reference timing edge for blanking is submitted to the SYNC COUNT card for this operation.

The SYNC COUNT card contains a series of integrated circuit J-K flip-flops to count out the proper number of horizontal lines which will be developed in each vertical field. Of course, a different count is required for each scanning rate. This is simply accomplished by utilizing a group reset technique. Outputs from the counter stages Z5 through Z10 (except Z5B) are submitted to a control gate that is connected to a common buss (Z2). Therefore, a mixture of different counted pulses is acquired which develops a reset pulse after an appropriate interval, according to programming jumpers which determine which counts are submitted to the gate. A matrix is provided on the card for selection of the reset counts as desired for any one scan rate. The reset pulse is developed by monostable Z1, 74121, and routed to the J-k flip-flops where all elements in the counter are reset simultaneously. The trigger resulting from this reset is then used for initiation of vertical pulses.

The trigger obtained at the counter reset is routed to the DRIVE/BLANKING card for initiation of V Blanking at bistable Z6C, Z6D. It is essential that the long blanking pulse be controlled in synchronism with the horizontal scanning to prevent apparent jitter in the television display. There-

fore, a proper selection of pulses is taken from the earlier stages of the SYNC COUNT card and routed to the control gate Z4 to time the end of the V Blanking pulse developed by the bistable on the DRIVE/BLANKING card. Pulse width is controlled by matrix interconnection on the SYNC COUNT card.

The V Drive pulse is developed by the same technique as V Blanking. The trigger pulse developed by monostable Z4 (74121) on the DRIVE/BLANKING card is routed to bistable Z6A, Z6B to start the V Drive pulse. Timing pulses selected from the J-K flip-flop counters to control gate Z3 on the SYNC card. The gate output is routed to gate Z6B to turn the bistable off, completing the V Drive pulse which is then routed out of the card through isolating stage Q3.

The vertical and horizontal blanking pulses are then combined to gate Z5D on the DRIVE/BLANKING card to provide a Mixed Blanking signal. Horizontal and vertical pulses are also routed out of the card as needed to initiate other actions by jumper selection of output stages Q1 through Q7.

Vertical sync is a pulse developed within the vertical blanking interval, ordinarily delayed 3H from the start of the blanking and having a duration of 3H. Therefore, it is necessary to provide multivibrators in the SYNC card, to produce the front porch delay and the vertical sync width. It is a further requirement that the vertical sync pulse be absolutely locked to the horizontal scanning rate. Therefore, pulses from the SYNC COUNT card are used to control bistable multivibrators which develop the vertical sync timing relationships. Bistable Z2A, Z2B produces a pulse three lines long (V front porch), Z1A, Z1B produces a six line pulse, and a pulse nine lines in length is produced by bistable Z3C, Z3D. Gate Z3A combines the three line and six line pulses to one which extends from the third to sixth line in the vertical interval, the V Sync pulse. Gate Z3B combines the nine line pulse with the V Sync pulse to make two pulses, one from the start of the vertical interval to the third line, and another from the sixth to ninth lines; this pulse series is used to control the insertion of equalizing pulses before and after V sync.

The equalizing pulses, at 2H rate, are developed by monostable Z5 (74121), triggered by the trailing edge of the front porch pulse developed by multivibrator Z10. The horizontal sync pulse is developed similarly by monostable Z4 (74121) at 2H rate, and counted down to H rate by gate Z8D.

All of these components - H sync, 2H equalizing pulses and serrations - are combined into the sync waveform in one of three selectable formats:

a. With equalizing pulses and serrations - H sync pulses are transmitted through gate Z7B except from the first to ninth lines of the vertical interval, as determined by gate Z8B. Equalizing pulses at 2H rate are introduced from the first to third and sixth to ninth lines through gate Z8C which is controlled by inverter Z6D, using the control pulse from gate Z3B. Serrations at 2H rate produced by monostable Z9, are inserted from the third to sixth lines of the vertical interval by gate Z7A.

b. Without equalizing pulses and serrations - Equalizing pulses are not permitted through gate Z8C, which is turned off by inverter Z6C, in turn controlled by grounding the inverter input at resistor R12 (Pin M). This also turns off gate Z8B and turns on Z7C, deleting sync pulses from the third to sixth lines of the vertical interval, substituting h-rate sync pulses for the 2H equalizing pulses.

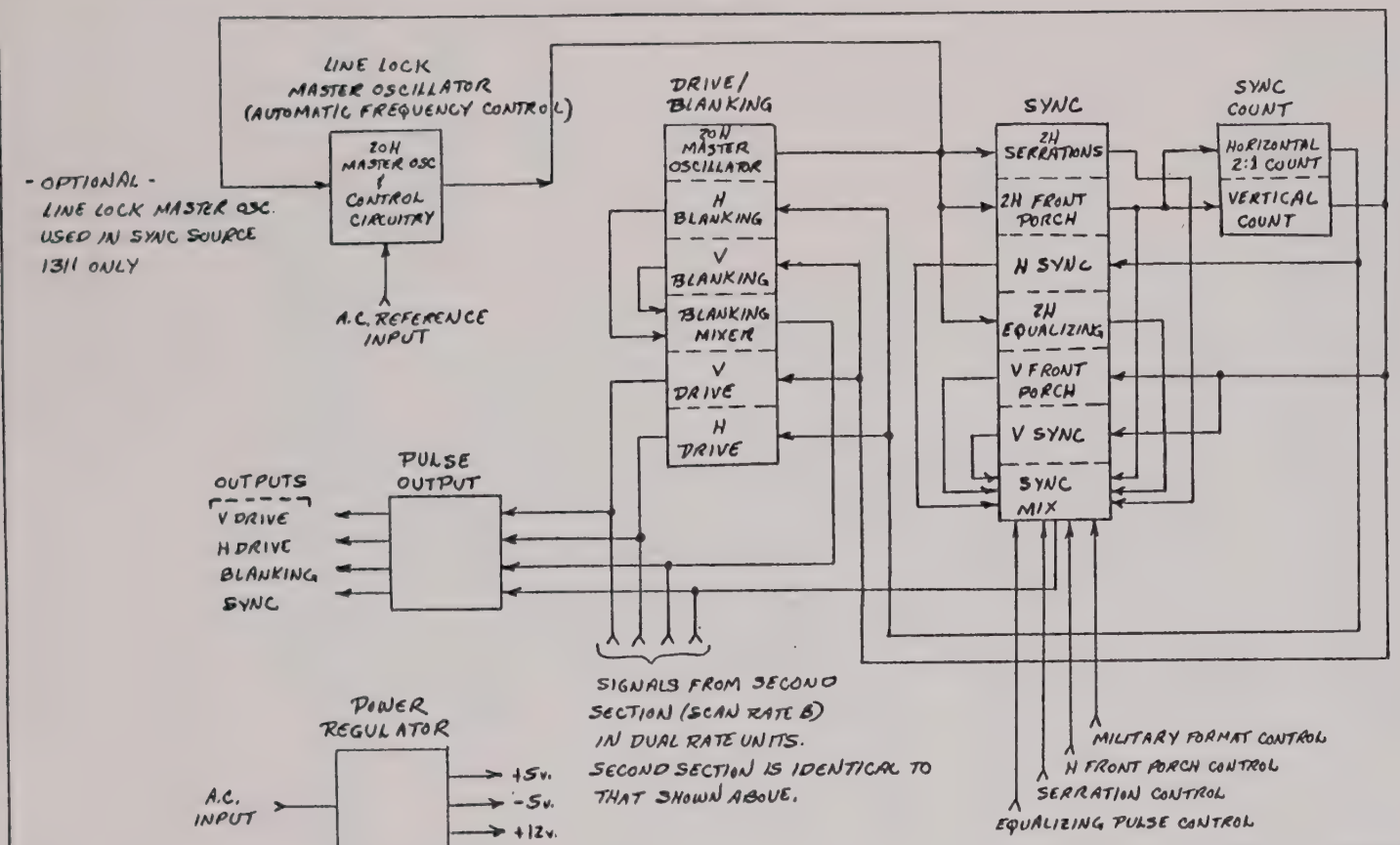
c. Military waveform - The sync waveform used in certain systems requires that there be no H rate or 2H content in the vertical front porch and that there be no equalizing pulses and serrations as well as no horizontal front porch. Therefore Pins M and T are grounded as in (b.) above, as is Pin U. the sync pulse is developed by Z4 triggered by the output of gate Z8A. This gate combines the serration and front porch pulses so that Z4 will be triggered by the longer of the two pulses usually serrations. However, gate Z1D blocks the serration pulses, causing Z4 to be triggered by the trailing edge of the front porch pulse, coincident with the start of blanking and drives. Gate Z7D normally would be blocked by low voltage at Pin N. When it is not blocked (+5v. at Pin N) gate Z7D deletes the sync pulses during the vertical front porch as commanded by the output of bistable Z2A, Z2B.

Sync generator outputs (H Drive, V Drive, Blanking and Sync) are processed through the PULSE OUTPUT card to properly drive coaxial cable at the required amplitude and impedance. Four identical circuits are used. The input is routed through bias network R1, R2 to saturating stage Q1. The collector waveform from Q1 is routed to push-pull output drivers, Q2, Q3. Diodes CR1, CR2 between Q1 collector and load resistor R3 compensate for the base-to-emitter drop of the output drivers. Series resistors R4 and R5 provide the proper cable drive source impedance, and R6 provides a ground return path. The output is a.c. coupled through C1 to the output. Pulse amplitude must be controlled; control is obtained by the level of voltage directed to collector load R3, established by series regulator Q13, in turn controlled by potentiometer R25.

The operations described above are conducted in the sequence shown on the accompanying function diagram. The complete waveform is shown on the following drawings. A complete detailed schematic of individual circuit cards is included in the following pages. Typical timing relationships for various scanning rates are shown in Table I.

SIGNAL SOURCE 1302
CCTV Sync Generator
Schematic and Layout Drawing Index

No.	Description
S-3006	Function Diagram
	Electrical Parts List Cover Sheet
PL-2003	Pulse Output
L-2003	Pulse Output
S-2003	Pulse Output
PL-2024	Sync
L-2024	Sync
S-2024	Sync
PL-2026	Drive/Blanking
L-2026	Drive/Blanking
S-2026	Drive/Blanking
PL-2025	Sync Count
L-2025	Sync Count
S-2025	Sync Count
S-3015	Control Panel Wiring



POWER REGULATOR CARD IS
USED IN SYNC SOURCE 1301 ONLY.

POWER FROM PARENT UNIT IS PROVIDED
FOR ACCESSORY OR COMBINATION UNITS.

VISUAL INFORMATION INSTITUTE, INC.
XENIA, OHIO

FUNCTION DIAGRAM
CCTV SYNC GENERATOR

DRN	DATE
JH	2-19-77
	DWG. NO. S-3006

ELECTRICAL PARTS LIST INTRODUCTION

A complete parts list is included in this section for each circuit card and for mechanical parts that contain parts considered replaceable. Repair parts are available from the factory. The following guide to typical suitable, replacement parts may assist in locating the proper part from a more convenient local source.

RESISTORS	Unless otherwise noted, 1/4w 10% tolerance IRC type GBT or equivalent, wattage as noted on schematic.
POTENTIOMETERS .	(Board Mounted) Bourns E-Z Trim Type 3067. Value as noted.
CAPACITORS . . .	(a) 1000pf and below - Dipped Mica, CDE Type CD15-, ARCO Type DM-15-. Value as noted, ±5%.
	(b) .001 uf to 0.1 uf - Wrapped Mylar, CDE Type WMF, 100v. ±10%.
	(c) 0.1 uf to 10 uf - Solid Tantalum, Sprague Type 150D - Polarized. ±10%, 15v. or higher voltage rating.
	(d) 2 uf to 350 uf - subminiature electrolytic Sprague Type TE (30D) -10% +150%. Value and rating as noted.
	(e) Above 100 uf - Electrolytic, Polarized, Sprague Type TVA, "Atom".
INDUCTORS	Variable - 0.44 uh to 350 uh - J. W. Miller Co., Series 4300.
	Fixed - 0.1 uh to 1000 uh - Nytronics Type DD.
SEMICONDUCTORS .	Per JEDEC Number 1N--, 2N--, etc.

NOTE: If a circuit card should employ special components not itemized above, they will be completely described on that particular circuit card parts list.

PARTS LIST FOR PULSE OUTPUT
PRINTED CIRCUIT BOARD ASS'Y

DATE 7-22-80
ARTWORK REV. C (6-80)

PL-2003
SHT 1 OF 2

REF DES	DESCRIPTION	VALUE	QTY	MANUFACTURER	PART NO.	PRICE	AMOUNT
	PULSE OUTPUT, P.C. BD. ASS'Y.		X	Vii	L-2003		$
	PULSE OUTPUT, P.C. BD. ARTWORK		X	Vii	CB-2003		
	·						
	· DIODE		8	BAS	IN4154		
	·						
	· TRANSISTOR		1	BAS	2N3053		
	· TRANSISTOR		8	BAS	2N5134/MPS-2369		
	· TRANSISTOR		4	BAS	2N5139		
	·						
	· RESISTOR, FIXED COMP	68 OHMS	8	Vii	A-1450		
	·	560 OHMS	1	↕	↕		
	·	1K OHMS	8				
	·	2.7K OHMS	4				
	· RESISTOR, FIXED COMP.	18K OHMS	4	↓	A-1450		
	· RESISTOR, VARIABLE	200 OHMS	1	Vii	A-1460		
	·						
	· CAPACITOR	25 µf, 25V	2	Vii	A-1458		
	· CAPACITOR	1000 µf, 16V	5	Vii	A-1459		

PARTS LIST FOR PULSE OUTPUT
PRINTED CIRCUIT BOARD ASSEMBLY

DATE 7-22-80
ARTWORK REV. C (6-80)

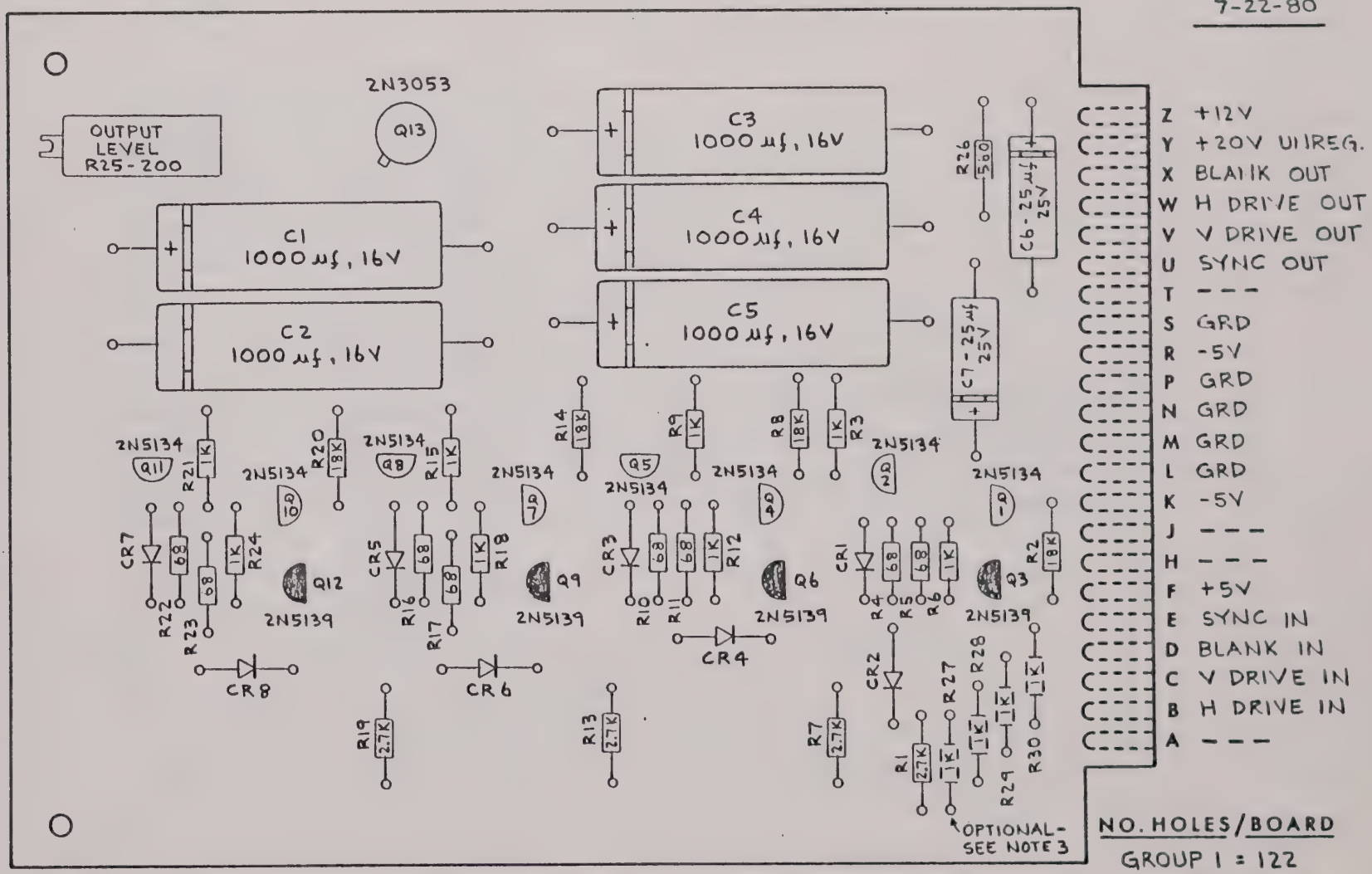
PL- 7003
SHT 2 OF 2

OPTIONAL PARTS PER GROUP LISTING AS FOLLOWS:

GROUP	OPTIONAL PARTS USED	OPTIONAL PARTS NOT USED
1		R27, R28, R29, R30
2	R27, R28, R29, R30 = 1KΩ	

PULSE OUTPUT 6-80 REV. C DWG. NO. L-2003

PARTS LIST
7-22-80



NO. HOLES/BOARD

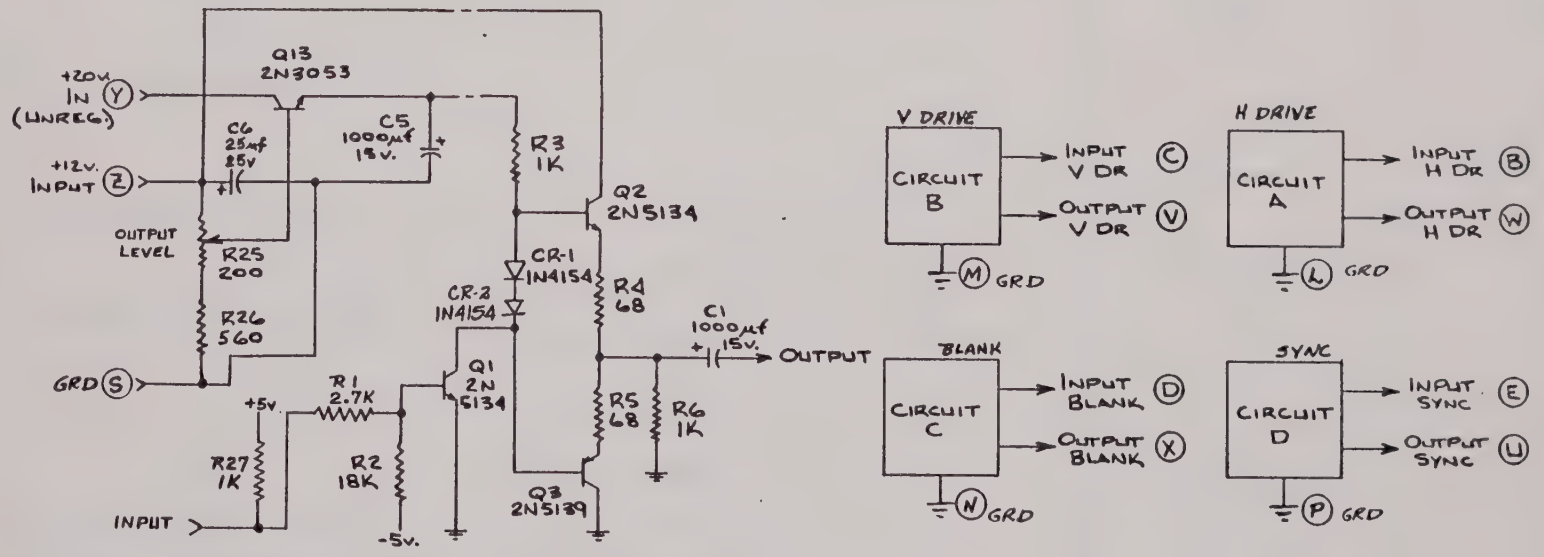
GROUP 1 = 122
GROUP 2 = 130

NOTES:
1) ALL RESISTORS = 1/4W, ±10% TOL.
2) ALL DIODES = IN4154.
3) FOR OPTIONAL PARTS PER GROUP LISTING, SEE PL-2003 (SHT. 2).
4) MPS-2369 TRANSISTOR MAY BE SUBSTITUTED FOR 2N5134.

L-2003 PULSE OUTPUT - SYNC SOURCE 1302

WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	+12v.	[CHASSIS, TB2]
Y	+DC UNREG	[CHASSIS, TB2]
X	BLANK OUT	[REAR PANEL, J3, BLANKING]
W	H DRIVE OUT	[REAR PANEL, J1, H DRIVE]
V	V DRIVE OUT	[REAR PANEL, J2, V DRIVE]
U	SYNC OUT	[REAR PANEL, J4, SYNC]
T	--	
S	GROUND	[PULSE OUTPUT, PIN P, PIN N, PIN M, PIN L][GROUND BUSS]
R	-5v.	[-5v. BUSS]
P	GROUND	[PULSE OUTPUT, PIN S, PIN N, PIN M, PIN L][GROUND BUSS]
N	GROUND	[PULSE OUTPUT, PIN S, PIN P, PIN M, PIN L][GROUND BUSS]
M	GROUND	[PULSE OUTPUT, PIN S, PIN P, PIN N, PIN L][GROUND BUSS]
L	GROUND	[PULSE OUTPUT, PIN S, PIN P, PIN N, PIN M][GROUND BUSS]
K	-5v.	[-5v. BUSS]
J	-12v.	[CHASSIS, TB2]
H	-E	[CHASSIS, TB2]
F	+5v.	[CHASSIS, TB2][CONTROL PANEL, S1, SCAN RATE]
E	SYNC IN	[SYNC A, PIN K][SYNC B, PIN K]
D	BLANK IN	[DRIVE/BLANKING A, PIN K][DRIVE/BLANKING B, PIN K]
C	V DRIVE IN	[DRIVE/BLANKING A, PIN H][DRIVE/BLANKING B, PIN H]
B	H DRIVE IN	[DRIVE/BLANKING A, PIN E][DRIVE/BLANKING B, PIN E]
A	--	



CIRCUIT DETAIL- USED FOUR PLACES

POWER CONNECTIONS-

+12v.	+5v	-5v	GRD
Z	F	K	S
		R	P
			N
			M
			L

NOTE: 1. RESISTORS $\frac{1}{4}$ W. ± 10% tol.
2. R27, R28, R29, & R30 ARE OPTIONAL PER GROUP LISTING, SEE PL-2003 (SHT 1)

VISUAL INFORMATION INSTITUTE, INC. XENIA, OHIO	
PULSE OUTPUT	
DRN. M. BURCH	DATE 2-25-75
APPVD.	DATE 3-18-77
	DWG No. S-2003
REV. 3-2-78	

PARTS LIST for SYNC
PRINTED CIRCUIT BOARD ASSY

DATE 8-1-77
ARTWORK REV. C (7-77)

PL- 2024
SHT 1 of 2

REF DES	DESCRIPTION	VALUE	QTY	MANUFACTURER	PART NO.	PRICE	AMOUNT
							$
	SYNC - P.C. BOARD ASSY		X	Vii	L-2024		
	SYNC - P.C. BOARD ARTWORK		X	Vii	CB-2024		
	TRANSISTOR		3	BAS	2N5134		
SEE GROUP LISTING	RESISTOR, FIXED COMP.	1K OHMS	15	Vii	A-1450		
		2.7K OHMS	3				
		4.7K OHMS	1				
		6.8K OHMS	2				
		8.2K OHMS	1				
	RESISTOR, FIXED COMP.	18K OHMS	2		A-1450		
	RESISTOR, VARIABLE	20K OHMS	4	Vii	A-1460		
	CAPACITOR	160 pf	1	Vii	A-1454		
	CAPACITOR	150 pf	1	Vii	A-1454		
		220 pf	1				
		270 pf	1				
		470 pf	1		A-1454		
		0.1uf, 10V	11		A-1455		
	CAPAITOR	20uf, 12V	1	Vii	A-1458		
	I.C.		4	BAS	7400		
	I.C.		1		7403		
	I.C.		1		7405		
	I.C.		1	BAS	7408		

PARTS LIST for SYNC
PRINTED CIRCUIT BOARD ASSY

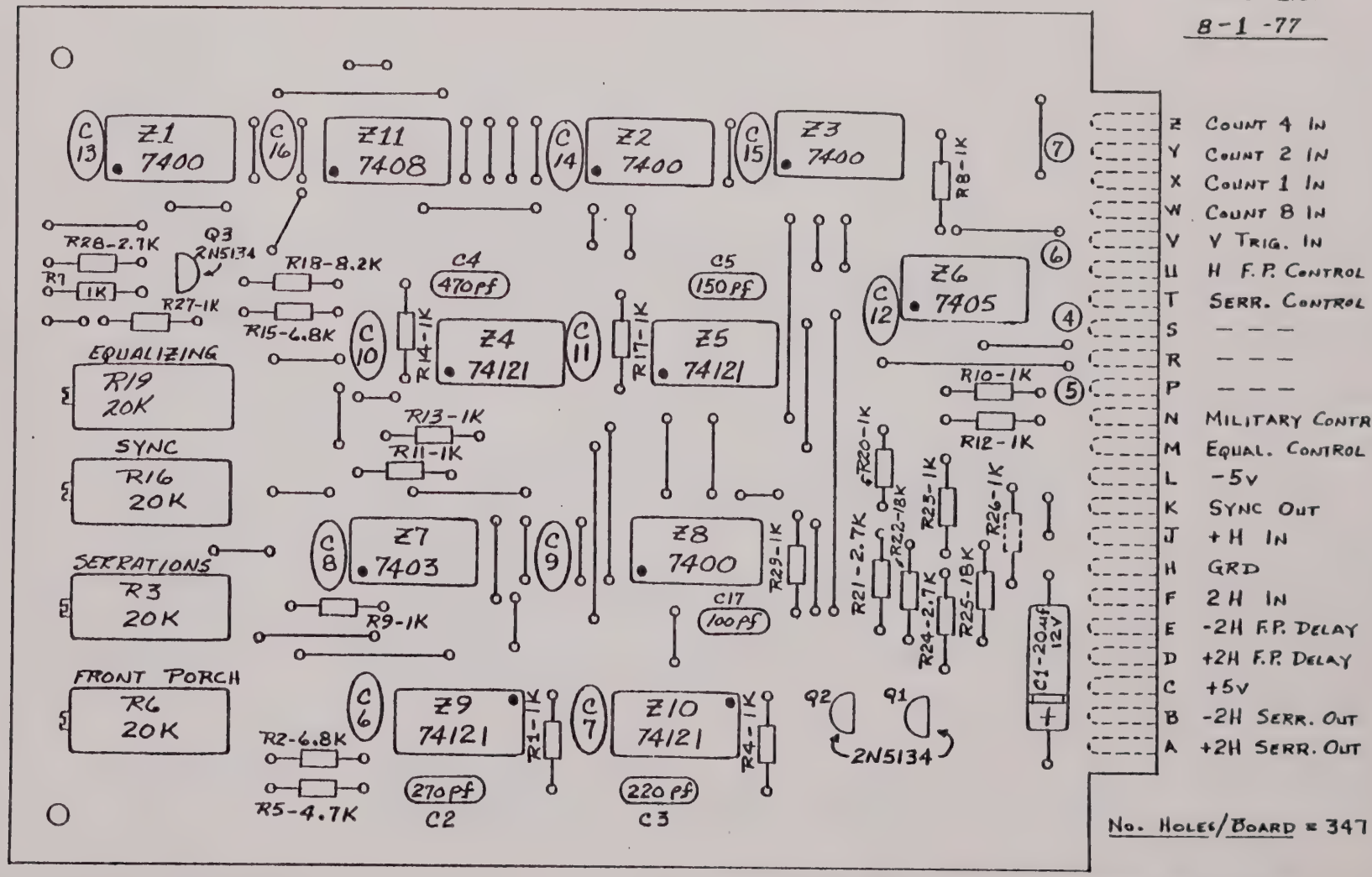
DATE 8-1-77
ARTWORK REV. C (7-77)

PL- 2024
SHT 2 of 2

REF DES	DESCRIPTION	VALUE	QTY	MANUFACTURER	PART NO.	PRICE	AMOUNT
	I.C.		4	BAS	74121		$
	I.C. SOCKET (14 PIN)		11	Vii	A-1465		
	BUS WIRE, #24 SOLID		AR	BAS			
	SELECTED PARTS PER GROUP LISTING:						
	GROUP 1 - R26 (1K OHM)	NOT USED					
	GROUP 2 - R26 (1K OHM)	IS USED -	ADD	1 MORE TO QTY ON SHT 1			

SYNC 7-77 REV. C DWG. NO. L-2024

PARTS LIST
8-1-77



No. Holes/Board = 347

NOTES:
1. ALL RESISTORS - ¼W, ±10% TOL.
2. C6 THRU C16 = 0.1µf, 10V
3. R26 IS OPTIONAL PER GROUP LISTING, SEE PL-2024 (SHT 2)
4. o—o BUS WIRE, #24 SOLID
5. REMOVE JUMPER (3) TO REMOVE 5 VOLT FROM PROM
6. REMOVE JUMPER (5) TO DEVELOPE MILITARY FORMAT; ALSO, REMOVE JUMPERS (4), (6), AND (7) FOR COMPLETE CONFORMANCE.
7. REMOVE JUMPER (6) TO REMOVE SERRATIONS
8. REMOVE JUMPER (7) TO DELETE HORIZONTAL FRONT PORCH

L-2024 SYNC A - SYNC SOURCE 1302

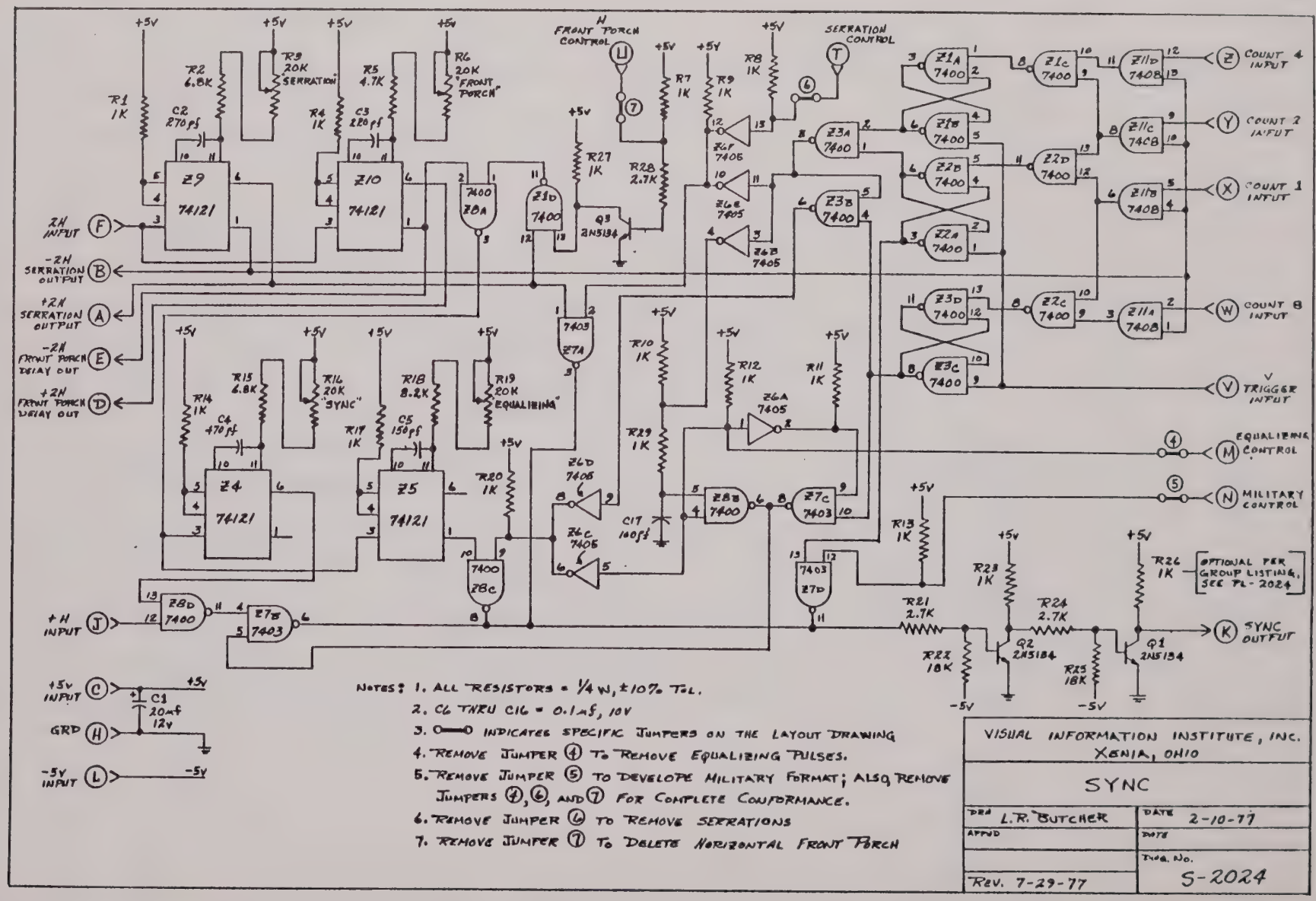
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	COUNT 4	[SYNC COUNT A, PIN D]
Y	COUNT 2	[SYNC COUNT A, PIN C]
X	COUNT 1	[SYNC COUNT A, PIN B]
W	COUNT 8	[SYNC COUNT A, PIN E]
V	V TRIG IN	[DRIVE/BLANKING A, PIN B]
U	FR PORCH CONT	[SYNC, PIN T, PIN N, PIN M, PIN H][GROUND BUSS]
T	SERR CONTROL	[SYNC, PIN U, PIN N, PIN M, PIN H][GROUND BUSS]
S	--	
R	--	
P	--	
N	MILITARY	[SYNC, PIN T, PIN U, PIN M, PIN H][GROUND BUSS]
M	EQ CONTROL	[SYNC, PIN T, PIN U, PIN N, PIN H][GROUND BUSS]
L	-5v.	[-5v. BUSS]
K	SYNC OUT	[PULSE OUTPUT, PIN E][SYNC B, PIN K]
J	+H IN	[SYNC COUNT A, PIN T]
H	GROUND	[SYNC, PIN N, PIN M, PIN T, PIN U][GROUND BUSS]
F	2H IN	[DRIVE/BLANKING A, PIN S]
E	--	
D	+2H FR PORCH	[SYNC COUNT A, PIN R]
C	+5v.	[DRIVE/BLANKING A, PIN V, PIN Z][SYNC COUNT A, PIN Z] [FRONT PANEL, S1, SCAN RATE]
B	--	
A	--	

L-2024 SYNC B - SYNC SOURCE 1302

WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	COUNT 4	[SYNC COUNT B, PIN D]
Y	COUNT 2	[SYNC COUNT B, PIN C]
X	COUNT 1	[SYNC COUNT B, PIN B]
W	COUNT 8	[SYNC COUNT B, PIN E]
V	V TRIG IN	[DRIVE/BLANKING B, PIN B]
U	FR PORCH CONT	[SYNC B, PIN T, PIN N, PIN M, PIN H][GROUND BUSS]
T	SERR CONTROL	[SYNC B, PIN U, PIN N, PIN M, PIN H][GROUND BUSS]
S	--	
R	--	
P	--	
N	MILITARY	[SYNC B, PIN T, PIN U, PIN M, PIN H][GROUND BUSS]
M	EQ CONTROL	[SYNC B, PIN T, PIN U, PIN N, PIN H][GROUND BUSS]
L	-5v.	[-5v. BUSS]
K	SYNC OUT	[PULSE OUTPUT, PIN E][SYNC A, PIN K]
J	+H IN	[SYNC COUNT B, PIN T]
H	GROUND	[SYNC B, PIN N, PIN M, PIN T, PIN U][GROUND BUSS]
F	2H IN	[DRIVE/BLANKING B, PIN S]
E	--	
D	+2H FR PORCH	[SYNC COUNT B, PIN R]
C	+5v.	[DRIVE/BLANKING B, PIN V, PIN Z][SYNC COUNT B, PIN Z] [FRONT PANEL, S1, SCAN RATE]
B	--	
A	--	



Notes: 1. ALL RESISTORS = 1/4 W, ±10% TOL.
2. C6 THRU C16 = 0.1mf, 10V
3. O—O INDICATES SPECIFIC JUMPERS ON THE LAYOUT DRAWING
4. REMOVE JUMPER ④ TO REMOVE EQUALIZING PULSES.
5. REMOVE JUMPER ⑤ TO DEVELOPE MILITARY FORMAT; ALSO REMOVE JUMPERS ④, ⑥, AND ⑦ FOR COMPLETE CONFORMANCE.
6. REMOVE JUMPER ⑥ TO REMOVE SERRATIONS
7. REMOVE JUMPER ⑦ TO DELETE HORIZONTAL FRONT PORCH

VISUAL INFORMATION INSTITUTE, INC.
XENIA, OHIO

SYNC

DRN L.R. BUTCHER	DATE 2-10-77
APPD	DATE
	DWG. NO. S-2024
REV. 7-29-77	

PARTS LIST for DRIVE / BLANKING PRINTED CIRCUIT BOARD ASSY

DATE 2-11-77

ARTWORK REV. B (2-77)

PL-2026

SHT 1 of 2

REF DES	DESCRIPTION	VALUE	QTY	MANUFACTURER	PART NO.	PRICE	AMOUNT
	DRIVE/BLANKING - P.C. BOARD ASSY		X	Vii	L-2026		$
	• DRIVE/BLANKING - P.C. BOARD ARTWORK		X	Vii	CB-2026		
	• TRANSISTOR		8	BAS	2N5134		
	• RESISTOR, FIXED COMP.	1K OHMS	20	Vii	A-1450		
	•	2.7K OHMS	8				
	•	10K OHMS	2				
	•	12K OHMS	1				
	• , FIXED COMP.	18K OHMS	7		A-1450		
	• RESISTOR, VARIABLE	20K OHMS	2	Vii	A-1460		
	• CAPACITOR	560pf	1	Vii	A-1454		
	•	910pf	1		A-1454		
	•	.001mf @ 100V	1		A-1456		
	•	0.1mf @ 10V	10		A-1455		
	• CAPACITOR	20mf @ 12V	2	Vii	A-1458		
	• I.C.		2	BAS	7400		
	• I.C.		1	BAS	7403		
	• I.C.		1	BAS	7490		
	• I.C.		3	BAS	74121		
	• I.C.		1	BAS	MC12060P		

PARTS LIST for DRIVE / BLANKING PRINTED CIRCUIT BOARD ASSY

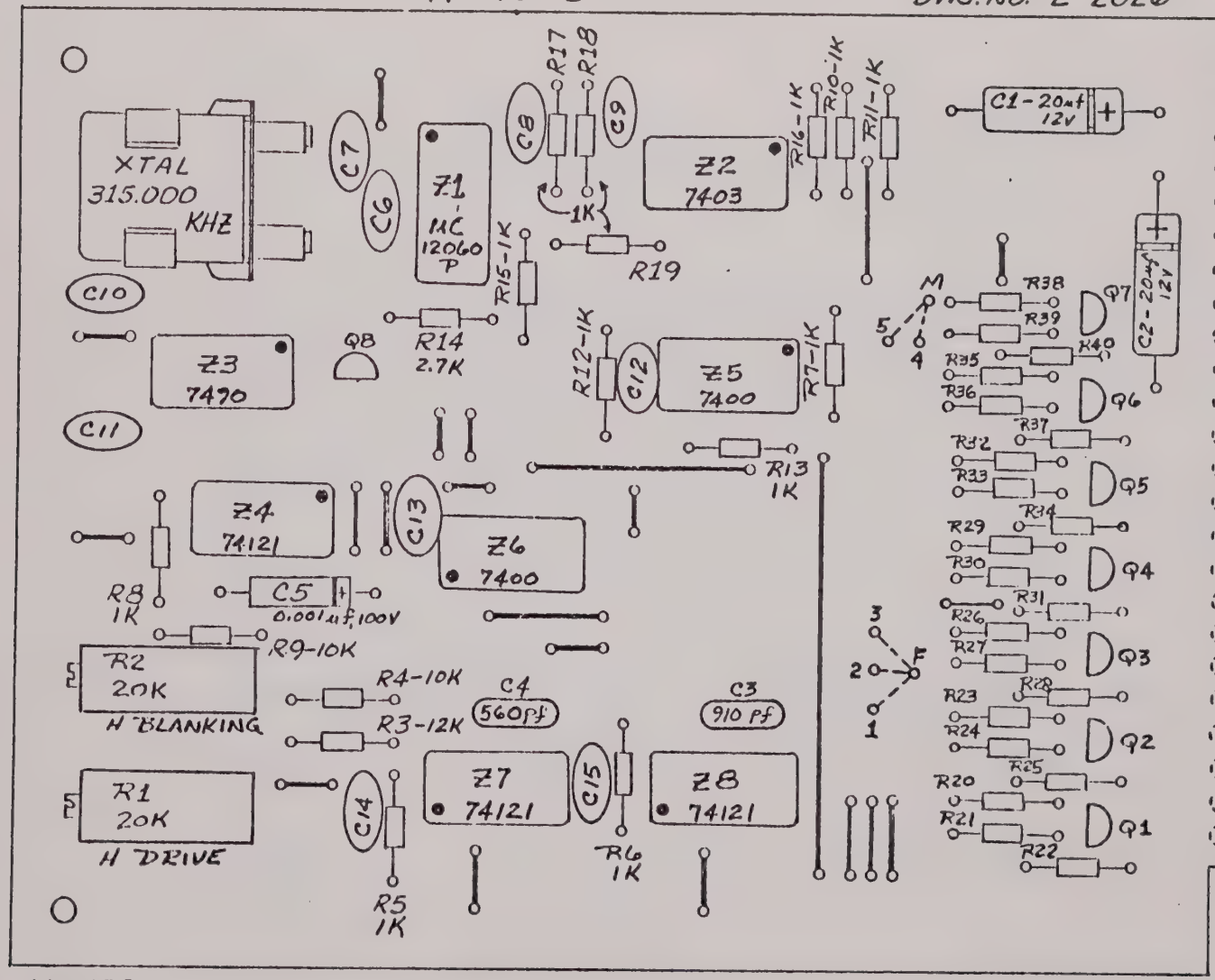
DATE 2-11-77 ARTWORK REV. B (2-77)

PL- 2026 SHT 2 of 2

REF DES	DESCRIPTION	VALUE	QTY	MANUFACTURER	PART NO.	PRICE	AMOUNT
							$
	• I.C. SOCKET (14 PIN)		7	Vii	A-1465		
	• I.C. SOCKET (16 PIN)		1	Vii	A-1465		
	• CRYSTAL	315.000 KHZ	1	BAS			
	• CRYSTAL HOLDER		1	BAS			
	• Screw, Binder HD	#2-56 x 1/4 Lg	2	BAS			
	• Nut-Hex	#2-56 THD	2	BAS			
	• BUS WIRE, #24 SOLID		AR	BAS			
	INSTALL SELECTED JUMPERS FOR GROUP FUNCTION AS FOLLOWS:						
	GROUP 1 1-F (-H DR)	4-M (+V BLANK)					
	GROUP 2 2-F (-V DR)	4-M (+V BLANK)					
	GROUP 3 3-F (-H BLNK)	4-M (+V BLANK)					
	GROUP 4 1-F (-H DR)	5-M (+H BLANK)					
	GROUP 5 2-F (-V DR)	5-M (+H BLANK)					
	GROUP 6 3-F (-H BLNK)	5-M (+H BLANK)					
	GROUP 7	- NO JUMPERS -					

DRIVE / BLANKING 2-77 REV. B

DWG. NO. L-2026



PARTS LIST

2-11-77

XEF.: SERIES F WIRING

Z	+5V
Y	GND.
X	-RESET OUT
W	+RESET OUT
V	XTAL M.O. CONTROL
U	2H M.O. IN
T	EXT. M.O. CONTROL
S	2H M.O. OUT
R	-RESET IN
P	+V TRIGGER OUT
N	-5V
M	SELECTED OUT
L	-BLANKING OUT
K	+BLANKING OUT
J	-V BLANK OUT
H	+V DRIVE OUT
F	SELECTED OUT
E	+H DRIVE OUT
D	BLANK WIDTH IN
C	DRIVE WIDTH IN
B	-V TRIGGER OUT
A	-H IN

NOTES:

1. ALL RESISTORS = 1/4W, ±10% TOL.
2. ALL TRANSISTORS = 2N5134
3. C6 THRU C15 = 0.1uf, 10V
4. o—o BUS WIRE, #24 SOLID
5. R22, R25, R28, R31, R34, R37, R40 = 1K
6. R20, R23, R26, R29, R32, R35, R38 = 2.7K
7. R21, R24, R27, R30, R33, R36, R39 = 18K
8. JUMPERS 1-2-3-F & 4-5-M SELECTED PER GROUP NO.

L-2026 DRIVE/BLANKING A - SYNC SOURCE 1301

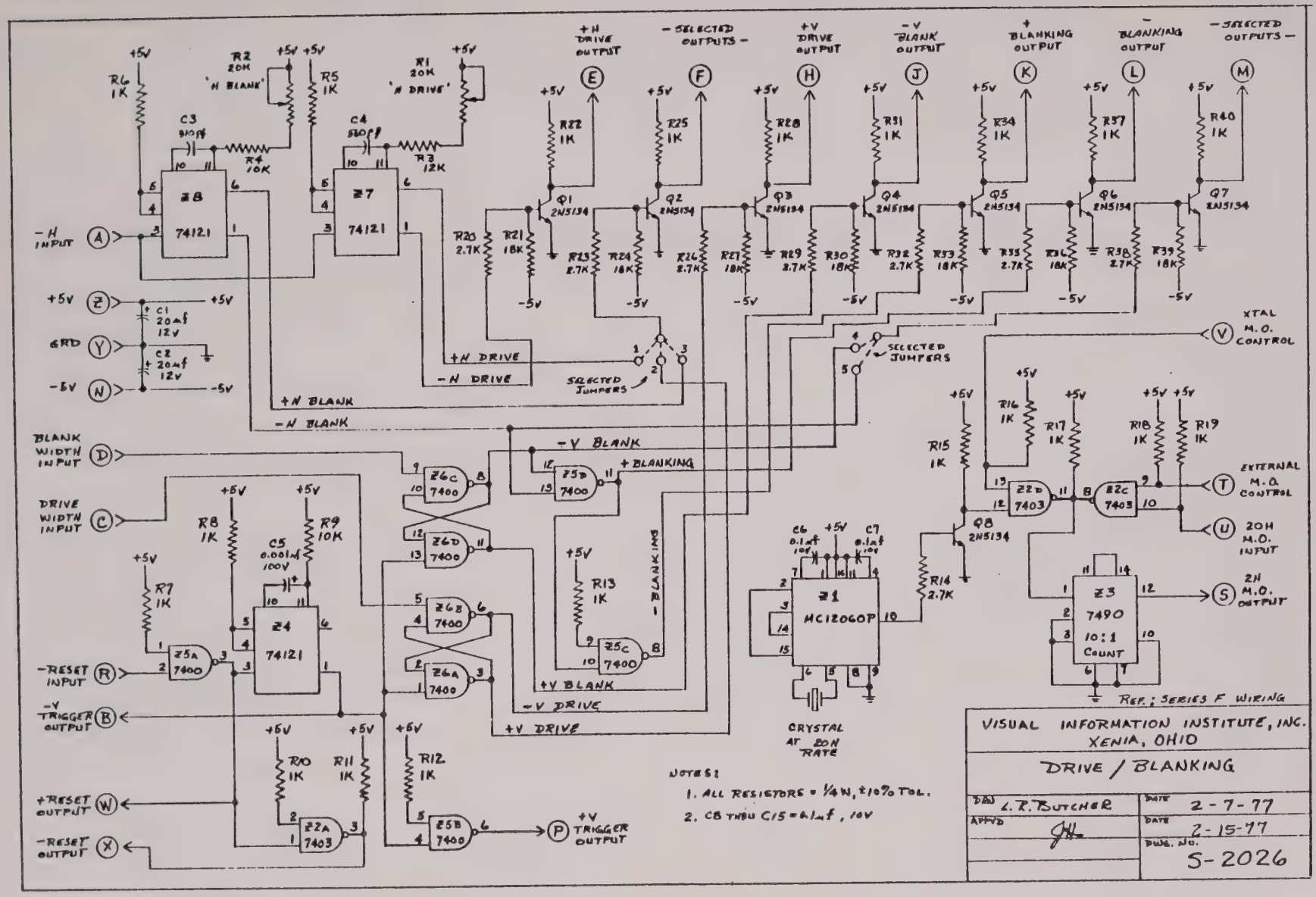
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	+5v.	[DRIVE/BLANKING A, PIN V][SYNC COUNT A, PIN Z][SYNC A, PIN C] [CONTROL PANEL, S1, SCAN RATE]
Y	GROUND	[DRIVE/BLANKING A, PIN U][GROUND BUSS]
X	--	
W	--	
V	+5v.	[DRIVE/BLANKING A, PIN Z][SYNC COUNT A, PIN Z][SYNC A, PIN C] [CONTROL PANEL, S1, SCAN RATE]
U	GROUND	[DRIVE/BLANKING A, PIN Y][GROUND BUSS]
T	--	
S	2H M.O. OUT	[SYNC A, PIN F]
R	-RESET IN	[SYNC COUNT A, PIN Y]
P	--	
N	-5v.	[-5v. BUSS]
M	--	
L	--	
K	+BLANKING OUT	[PULSE OUTPUT, PIN D][DRIVE/BLANKING B, PIN K]
J	--	
H	+V DRIVE OUT	[PULSE OUTPUT, PIN C][DRIVE/BLANKING B, PIN H]
F	--	
E	+H DRIVE OUT	[PULSE OUTPUT, PIN B][DRIVE/BLANKING B, PIN E]
D	V BLANK WIDTH	[SYNC COUNT A, PIN W]
C	V DRIVE WIDTH	[SYNC COUNT A, PIN X]
B	-V TRIG OUT	[SYNC A, PIN V]
A	-H INPUT	[SYNC COUNT A, PIN U]

L-2026 DRIVE/BLANKING B - SYNC SOURCE 1301

WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	+5v.	[DRIVE/BLANKING B, PIN V][SYNC COUNT B, PIN Z][SYNC B, PIN C] [CONTROL PANEL, S1, SCAN RATE]
Y	GROUND	[DRIVE/BLANKING B, PIN U][GROUND BUSS]
X	--	
W	--	
V	+5v.	[DRIVE/BLANKING B, PIN Z][SYNC COUNT B, PIN Z][SYNC B, PIN C] [CONTROL PANEL, S1, SCAN RATE]
U	GROUND	[DRIVE/BLANKING B, PIN Y][GROUND BUSS]
T	--	
S	2H M.O. OUT	[SYNC B, PIN F]
R	-RESET IN	[SYNC COUNT B, PIN Y]
P	--	
N	-5v.	[-5v. BUSS]
M	--	
L	--	
K	+BLANKING OUT	[PULSE OUTPUT, PIN D][DRIVE/BLANKING A, PIN K]
J	--	
H	+V DRIVE OUT	[PULSE OUTPUT, PIN C][DRIVE/BLANKING A, PIN H]
F	--	
E	+H DRIVE OUT	[PULSE OUTPUT, PIN B][DRIVE/BLANKING A, PIN E]
D	V BLANK WIDTH	[SYNC COUNT B, PIN W]
C	V DRIVE WIDTH	[SYNC COUNT B, PIN X]
B	-V TRIG OUT	[SYNC B, PIN V]
A	-H INPUT	[SYNC COUNT B, PIN U]


+H DRIVE OUTPUT
- SELECTED OUTPUTS -
+V DRIVE OUTPUT
-V BLANK OUTPUT
+ BLANKING OUTPUT
- BLANKING OUTPUT
- SELECTED OUTPUTS -
-H INPUT
+5V
GRD
-5V
BLANK WIDTH INPUT
DRIVE WIDTH INPUT
-RESET INPUT
-V TRIGGER OUTPUT
+RESET OUTPUT
-RESET OUTPUT
+V TRIGGER OUTPUT
+N DRIVE
-N DRIVE
+N BLANK
-N BLANK
-V BLANK
+BLANKING
+V BLANK
-V DRIVE
+V DRIVE
- BLANKING
SELECTED JUMPERS
XTAL M.O. CONTROL
EXTERNAL M.O. CONTROL
20H M.O. INPUT
2H M.O. OUTPUT
CRYSTAL AT 20N RATE
Z1 MC12060P
Z3 7490 10:1 COUNT
Z4 74121
Z7 74121
Z8 74121
Z2A 7403
Z2C 7403
Z2D 7403
Z5A 7400
Z5B 7400
Z5C 7400
Z6A 7400
Z6B 7400
Z6C 7400
Z6D 7400
Q1 2N5134
Q2 2N5134
Q3 2N5134
Q4 2N5134
Q5 2N5134
Q6 2N5134
Q7 2N5134
Q8 2N5134
NOTES:
1. ALL RESISTORS = 1/4W, ±10% TOL.
2. C8 THRU C15 = 0.1mf, 10V
REF.; SERIES F WIRING
VISUAL INFORMATION INSTITUTE, INC.
XENIA, OHIO
DRIVE / BLANKING
DRN L.R. BUTCHER
DATE 2-7-77
APPVD
DATE 2-15-77
DWG. NO. S-2026

PARTS LIST for SYNC COUNT PRINTED CIRCUIT BOARD ASSY

DATE 3-21-78 ARTWORK REV. 0 (10-76)

PL-2025 SHT 1 of 2

REF DES	DESCRIPTION	VALUE	QTY	MANUFACTURER	PART NO.	PRICE	AMOUNT
	SYNC COUNTER P.C. BOARD ASSY		X	Vii	L-2025		$
	SYNC COUNTER P.C. BOARD ART WORK		X	Vii	CB-2025		
	RESISTOR, FIXED COMP.	1K OHM	15	Vii	A-1450		
	RESISTOR, FIXED COMP.	2.7K OHM	1	Vii	A-1450		
	CAPACITOR	470pf	1	Vii	A-1454		
	↕	.001uf @ 100V	1	Vii	A-1456		
		0.1uf @ 10V	10	Vii	A-1455		
	CAPACITOR	20uf @ 12V	1	Vii	A-1458		
	I.C.		2	BAS	7430		
	I.C.		6	BAS	7473		
	I.C.		1	BAS	74121		
	I.C.		1	BAS	74133		
	I.C. SOCKET (14 Pin)		9	Vii	A-1465		
	I.C. SOCKET (16 Pin)		1	Vii	A-1465		
	BUS WIRE #24 SOLID		AR	BAS			

PARTS LIST for SYNC COUNT — DATE 3-21-78 — PL- 2025

PRINTED CIRCUIT BOARD ASSY — ARTWORK REV. 0 (10-76) — SHT 2 of 2

SELECT THE JUMPER ARRANGEMENT DESIRED FROM THE FOLLOWING TABULATION:
(JUMPER BETWEEN GROUPED COUNT NUMBERS AND EITHER A SINGLE-OR-DOUBLE LETTER AS SHOWN PER SCAN RATE DESIRED.)

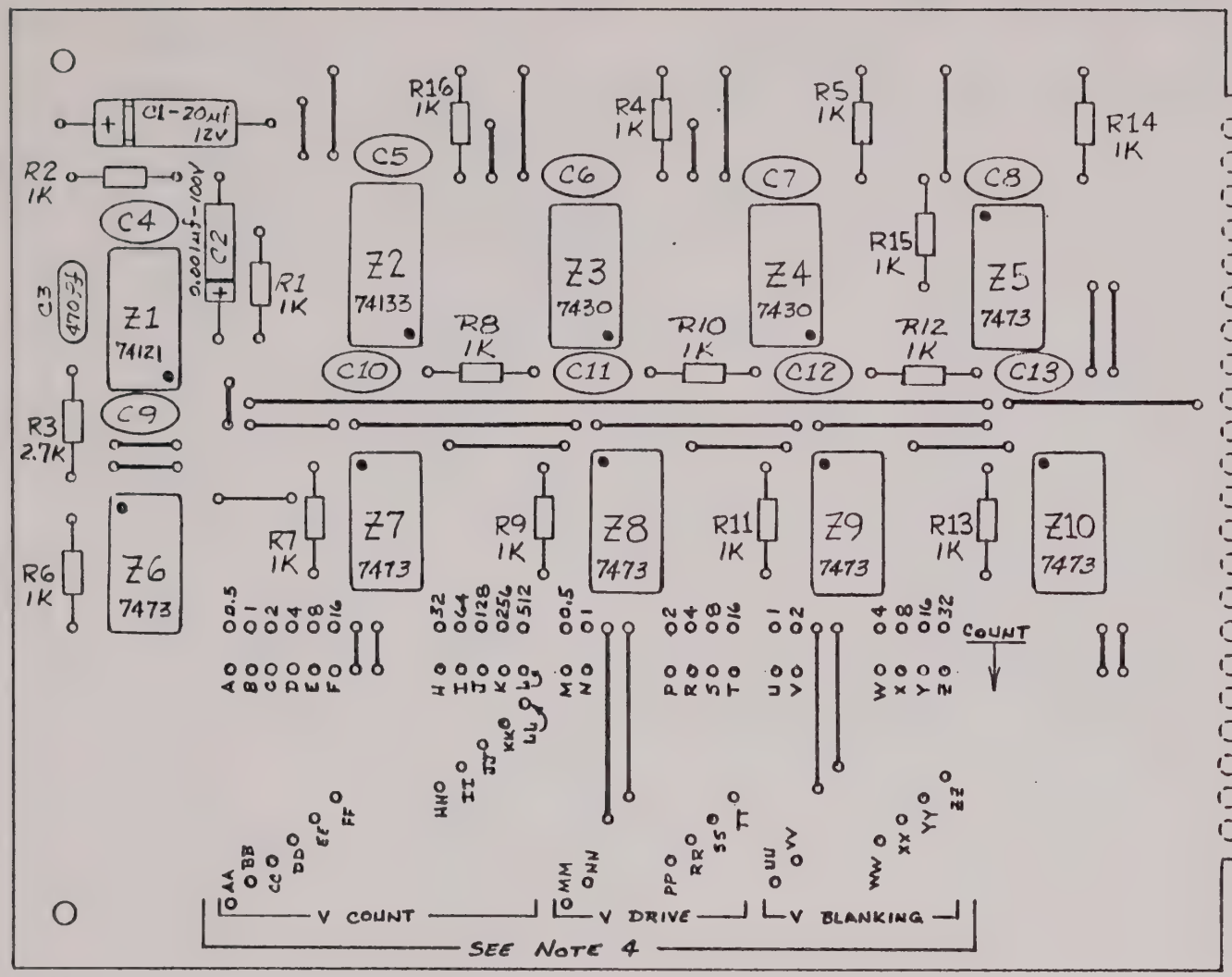
COUNT / SCAN RATE - (H.O.)	V COUNT										
	0.5	1	2	4	8	16	32	64	128	256	512
525/60-(315.00KHz)	A	B	CC	DD	E	F	H	I	J	KK	L
625/50-(312.50KHz)	A	B	C	D	EE	FF	HH	I	J	KK	L
675/60-(405.00KHz)	A	BB	C	D	E	FF	H	II	J	KK	L
729/60-(437.40KHz)	A	B	C	DD	EE	F	HH	II	J	KK	L
875/60-(525.00KHz)	A	BB	C	DD	E	FF	HH	I	JJ	KK	L
945/60-(567.00KHz)	A	B	C	D	EE	FF	H	II	JJ	KK	L
1023/60-(613.80KHz)	A	BB	CC	DD	EE	FF	HH	I.I	JJ	KK	L
1029/60-(617.40KHz)	A	B	CC	D	E	F	H	I	J	K	LL
1225/60-(735.00KHz)	A	B	C	DD	E	F	HH	II	J	K	LL

V DRIVE					
0.5	1	2	4	8	16
MM	N	PP	R	SS	T
MM	N	PP	R	SS	T
MM	NN	P	RR	SS	T
MM	N	PP	RR	SS	T
MM	NN	P	R	S	TT
MM	N	PP	R	S	TT
MM	N	P	RR	S	TT
MM	N	P	RR	S	TT
MM	N	P	R	SS	TT

V BLANKING					
1	2	4	8	16	32
U	V	WW	X	YY	Z
U	V	WW	X	YY	Z
U	VV	W	XX	YY	Z
U	V	WW	XX	YY	Z
UU	V	W	X	Y	ZZ
U	V	WW	X	Y	ZZ
UU	VV	WW	X	Y	ZZ
UU	VV	WW	X	Y	ZZ
U	VV	WW	XX	Y	ZZ

SYNC COUNT 10-76 REV. 0 DWG. NO. L-2025

PARTS LIST 3-21-78



No. HOLES/BOARD = 306

NOTES:

1. ALL RESISTORS = 1/4 W, ±10% TOL.
2. C4 THRU C13 = 0.1uf, 10V
3. ——o Bus Wire, #24 Solid
4. JUMPER ARRANGEMENT SELECTED PER SCAN RATE COUNT DESIRED, SEE PL-2025 (SHT 2)

L-2025 SYNC COUNT A - SYNC SOURCE 1301

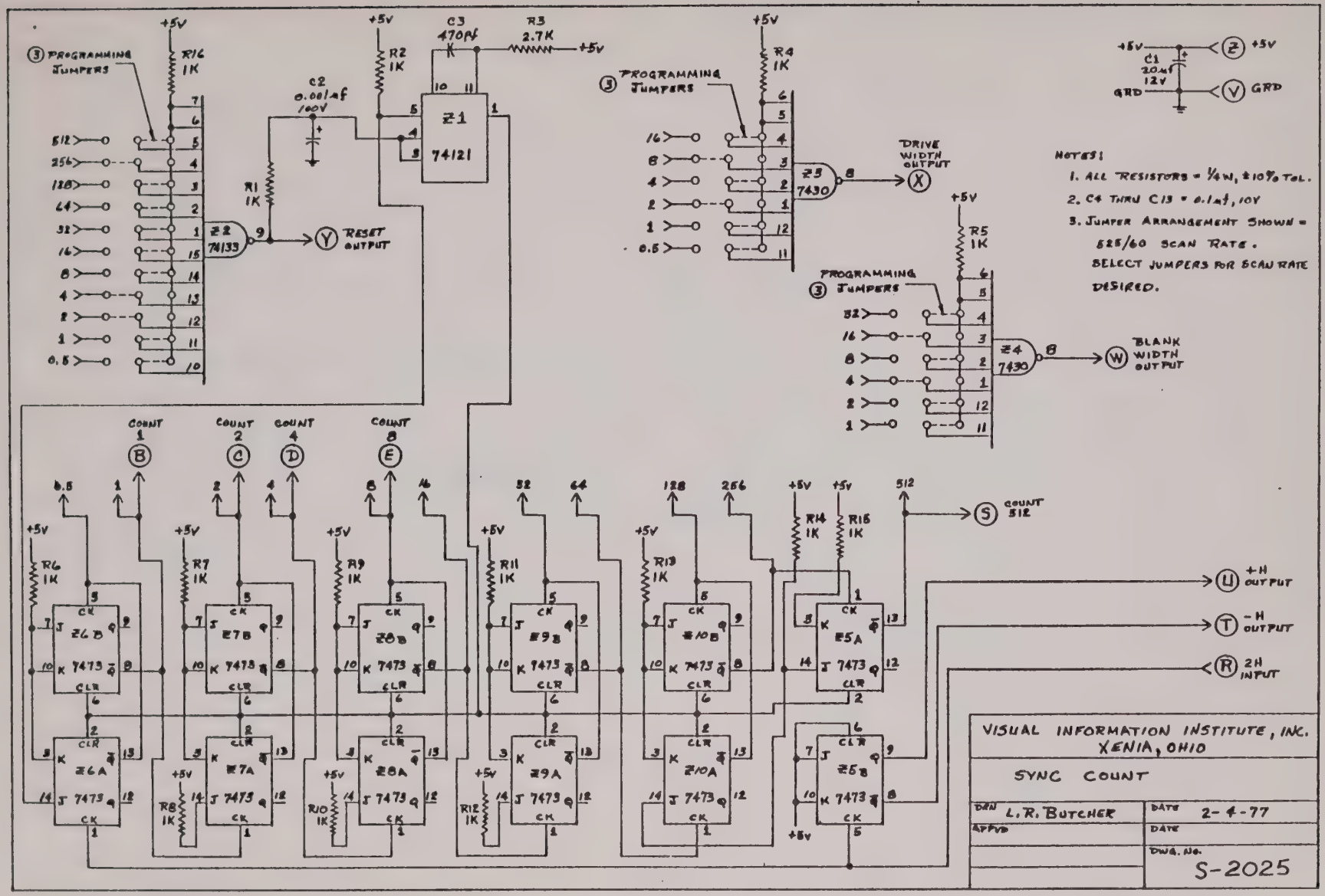
WIRING INTERCONNECTIONS

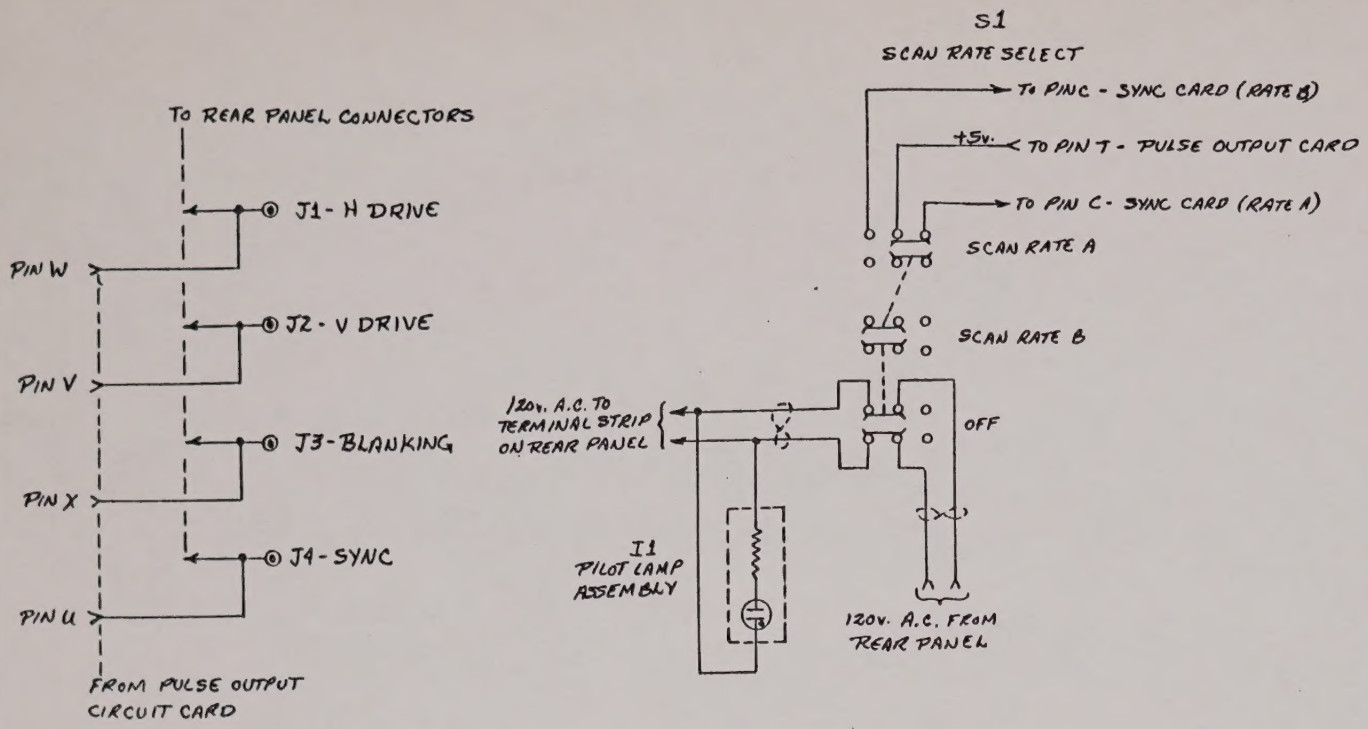
CONNECTOR PIN	FUNCTION	DESTINATION
Z	+5v.	[DRIVE/BLANKING A, PIN Z, PIN V][SYNC A, PIN C] [CONTROL PANEL, S1, SCAN RATE]
Y	-RESET OUT	[DRIVE/BLANKING A, PIN R]
X	V DR WIDTH	[DRIVE/BLANKING A, PIN C]
W	V BLANK WIDTH	[DRIVE/BLANKING A, PIN D]
V	GROUND	[GROUND BUSS]
U	-H OUT	[DRIVE/BLANKING A, PIN A]
T	+H OUT	[SYNC A, PIN J]
S	--	
R	2H IN	[SYNC A, PIN D]
P	--	
N	--	
M	--	
L	--	
K	--	
J	--	
H	--	
F	--	
E	8 OUT	[SYNC A, PIN W]
D	4 OUT	[SYNC A, PIN Z]
C	2 OUT	[SYNC A, PIN Y]
B	1 OUT	[SYNC A, PIN X]
A	--	

L-2025 SYNC COUNT B - SYNC SOURCE 1301

WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	+5v.	[DRIVE/BLANKING B, PIN Z, PIN V][SYNC B, PIN C] [CONTROL PANEL, S1, SCAN RATE]
Y	-RESET OUT	[DRIVE/BLANKING B, PIN R]
X	V DR WIDTH	[DRIVE/BLANKING B, PIN C]
W	V BLANK WIDTH	[DRIVE/BLANKING B, PIN D]
V	GROUND	[GROUND BUSS]
U	-H OUT	[DRIVE/BLANKING B, PIN A]
T	+H OUT	[SYNC B, PIN J]
S	--	
R	2H IN	[SYNC B, PIN D]
P	--	
N	--	
M	--	
L	--	
K	--	
J	--	
H	--	
F	--	
E	8 OUT	[SYNC B, PIN W]
D	4 OUT	[SYNC B, PIN Z]
C	2 OUT	[SYNC B, PIN Y]
B	1 OUT	[SYNC B, PIN X]
A	--	


+5V
C3 470pf
R3 2.7K
R2 1K
C2 0.001uf 100V
Z1 74121
R1 1K
Z2 74133
(3) PROGRAMMING JUMPERS
R16 1K
512
256
128
64
32
16
8
4
2
1
0.5
(Y) RESET OUTPUT
R4 1K
Z3 7430
(X) DRIVE WIDTH OUTPUT
R5 1K
Z4 7430
(W) BLANK WIDTH OUTPUT
C1 20uf 12V
GRD
(Z) +5V
(V) GRD
NOTES:
1. ALL RESISTORS = 1/4W, ±10% TOL.
2. C4 THRU C13 = 0.1uf, 10V
3. JUMPER ARRANGEMENT SHOWN = 525/60 SCAN RATE. SELECT JUMPERS FOR SCAN RATE DESIRED.
COUNT 1
COUNT 2
COUNT 4
COUNT 8
(B)
(C)
(D)
(E)
(S) COUNT 512
R6 1K
R7 1K
R8 1K
R9 1K
R10 1K
R11 1K
R12 1K
R13 1K
R14 1K
R15 1K
Z6B
Z7B
Z8B
Z9B
Z10B
Z5A
Z6A
Z7A
Z8A
Z9A
Z10A
Z5B
7473
(U) +H OUTPUT
(T) -H OUTPUT
(R) 2H INPUT
VISUAL INFORMATION INSTITUTE, INC.
XENIA, OHIO
SYNC COUNT
DWN L.R. BUTCHER
DATE 2-4-77
APPVD
DATE
DWG. No.
S-2025



VISUAL INFORMATION INSTITUTE, INC. XENIA, OHIO	
CONTROL PANEL WIRING SYNC SOURCE 1305	
DRN JW	DATE 9-22-77
	DWG. NO. S-3015